MODERN Machine Shop

A Magazine for Machine Shop Executives
HOWARD CAMPBELL, Editor

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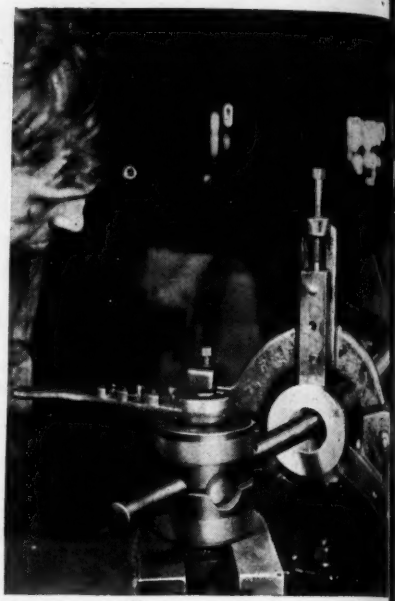

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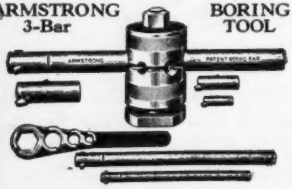

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MODERN Machine Shop

JULY, 1931

CINCINNATI, OHIO VOL. 4, NO. 2

Arc Welding In the Locomotive Boiler Shop, I.

Preparing Boiler Seams For Welding—Methods Used In Welding Firebox Seams—"Back-Step" Method of Welding

By JAS. M. VOSSLER,
Welding Supervisor, Southern Pacific Lines, Houston, Texas

ON no other part of the locomotive is it more important to see that the welding is properly done than on the boiler. Too much care cannot be exercised. Only the best and most experienced welders should be employed for such work, and they should constantly be watched to see that they do not lapse into carelessness. Where possible, welders who have had experience as boiler makers should be used in preference to those who have not. The advantage is self-evident.

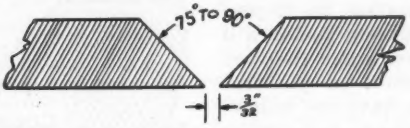

Fig. 1—Diagram showing angle of opening for welding boiler plate.

As much importance should be attached to the preparation for welding as to the actual welding, since the success of the weld is generally equally dependent upon both. The preparation of the work for welding is divided into two operations. The first is the beveling or chipping of the seams to be welded, and the second is the cleaning preparatory to welding.

In beveling for welding, the angle of opening in nearly all cases should be from 75 to 90 deg., as indicated in Fig. 1. In certain cases the angle can be made smaller and a good weld can be made and time saved. These cases are, however, more the exception than the rule, and it is best to avoid the small angles. In all large shops it is necessary to standardize upon methods that are known to be successful in all cases, so as to eliminate the possibility of failures that might be caused by poor judgment as exercised by the individual welder.

In order that the weld shall extend through the sheet, an opening of about 3/32 in. should be left at the apex of the bevel or vee cut into the metal. In chipping a vee into a fire box sheet or beveling a plate to be mated up with another, it is difficult, and in some cases impossible, to hold this opening uniform. It should, however, never be permitted to go over 1/8 in., nor under about 3/32 in. Making

the opening too narrow will result in preventing the welder from properly welding through the sheet, while making the opening too wide may result in burning the deposited metal in an attempt to bridge the opening.

In Fig. 2 will be seen the cross-section of the finished weld. It will be noted that the weld is shown reinforced about 20 per cent. In order

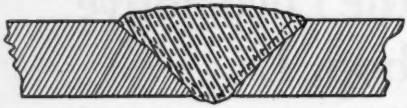

Fig. 2—Cross-section of the finished weld. The dotted lines show the edge of the vee prior to welding.

to illustrate the amount of penetration, the edges of the vee, as it existed prior to welding, are shown with dotted lines. Care should be exercised to see that good penetration is secured, but care also should be exercised to see that it is not too deep. The penetration should not be less than $\frac{1}{16}$ in. nor greater than $\frac{1}{8}$ in. for the thicknesses of metal encountered in boiler welding. When the penetration is too shallow the deposited metal and the parent metal will not be properly united, while the heat conditions which result in penetration that is too deep, have the following bad results:

1. The excessive heat sets up high contraction strains in the sheet.
2. The sustained high temperature which results greatly increases the size of the crystals in the structure of the deposited metal.
3. Unnecessarily high temperatures will result in a partial burning of the deposited metal.
4. With excessive contraction strains, increased crystal sizes and partially burned metal, failure of the weld frequently results.
5. Electrical energy is wasted.

The above weld preparation covers such welds where the welder can get to one side of the weld only. Where it is possible for the welder to weld from both sides of the sheet, the preparation should be more as described below.

Ordinarily when the welder can get to both sides of the piece of work that is to be welded, the metal will be veed out from both sides to center. But in railway firebox work, it is, in most cases, of considerable advantage to prepare the work as shown in Fig. 3. Little or no gap should be left at the apex of the vee. Where possible, the edges of the sheet are scarfed by a bevel shearing machine.

After the edges are beveled, sheets are set into position and bolted in place by use of a strip of iron of about the same thickness or a little above that of the sheets being welded. This strip, which is generally called a cold strip, is of sufficient width to take in the row of stay bolts on each side of the seam and extends the entire length of the weld. Holes are punched in the strip to mate up with the row

Fig. 3—In welding a firebox, little or no gap should be left at the apex of the vee. The "cold strip" holds the work in place.

of stay bolt holes on each side of the weld, and then the strip is bolted to the sheets by inserting machine bolts through these holes. It can clearly be seen that this is not only an excellent way to hold the sheets in place, but it brings them into perfect alignment. The principal advantage of such preparation is obtained in the building of new fire boxes, especially those of the combustion chamber type.

In making the weld, the procedure is the same as that described later on in this article, with the exception that no effort is made to weld through the sheet. In fact, with the edges of the bevels touching or near touching, as shown in Fig. 3, and with the cold

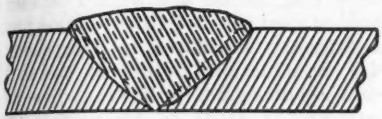

Fig. 4—Cross-section of fire-box weld. Flaws at the apex of the vee are practically unavoidable, and should be removed.

strip bolted in the rear of the weld, it is quite difficult to do so. The weld will, however, extend through to the cold strip in a few small places, but not sufficiently to prevent the strip from being easily removed without damage to the weld or strip.

After the weld is completed and the cold strip has been removed, a cross-section of the weld will generally appear as shown in Fig. 4. Examination of any weld made from one side in a fire-box or similar vessel will show some flaws at the apex of the vee. These flaws will be less when the weld is made against a cold plate, but, nevertheless, they should be removed. The author has seen them

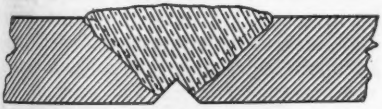

Fig. 5—Flaws may be eliminated by cutting a small vee at the rear of the weld and building up as shown in Fig. 6.

welded over by using a small rod and high current so as to secure deep penetration. This, however, is certainly not very good practice. It is better to take a diamond point chisel and cut a vee at the rear of the weld about ⅛ in. deep or of sufficient depth to remove the flaws, as shown in Fig. 5. This cut is then welded up by the back step method, as described below. Fig. 6 shows a cross-section of the finished weld. The advantages of this type of weld are as follows:

1. Time is saved by beveling the sheets with the bevel shearing machine instead of using hand tools.
2. All flaws at rear of weld are removed, and the strength of the weld is increased.
3. The cold strip holds the sheets in perfect alignment and permits easy assembling of parts in new firebox construction.

In preparing for welding, the matter of cleaning is important. All oil, soot, grease or paint should be removed from the sheet to a distance of at least one inch from the edge of the weld. These are carbon bearing substances, and will decompose in the

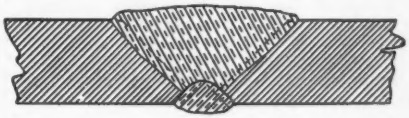

Fig. 6—Cross-section of finished fire-box weld.

heat of the arc. The carbon that is liberated will enter the molten metal in the puddle of the arc in much the same manner that it enters steel in case hardening. Thus, the carbon content will be raised to such a point that the chilling action of the comparatively cold metal adjacent to the weld will harden the deposited metal as the arc passes on. Welds so carbonized and hardened are brittle and frequently fail. The best method of cleaning oil, grease, soot and paint from firebox sheets is by use of the acetylene torch. Either a welding torch with an oxidizing flame, or a cutting torch applied with the cutting valve slightly open will remove any of the above mentioned substances very rapidly. The excess of oxygen will quickly consume them.

The necessity of removing rust is

obvious, and needs no discussion. Very frequently it can be removed with the wire brush, but if it is heavy, a chisel should be used.

The sand blast is often used for cleaning work preparatory to welding, but the author has not found the sand blast a particularly good method of cleaning. Small particles of the sand are usually embedded in the surface of the steel by the blast, and are extremely difficult to remove. If left in the surface of the steel, they will interfere with the success of the weld, often causing small blow holes or gas pockets to be formed in the steel.

In all forms of autogenous welding, great care must be exercised to see that proper care is taken of expansion and contraction. This is a difficult matter in locomotive firebox welding, as the sheets are held more or less rigid by stay bolts, and contraction after welding can only be partially compensated for. If we start at one end of a firebox seam, and weld to the other end, the strain placed in the sheet by contraction of the weld will increase as the weld progresses. When very long seams are welded between well-stayed sheets without taking precautionary measures to compensate for contraction, failure of the weld will result sooner or later. Where no attempt is made to compensate for contraction or where the attempt is insufficient, the weld will eventually fail. The proper method of allowing for contraction in firebox welding is to tie the seam in advance of welding and back step the weld.

(In the concluding section of this article, the author will describe the "back-step" method of welding fire-box seams and tell how to relieve the strains after welding.)

Furnace Atmospheres

By R. H. KASPER

NEARLY everyone who hardens tool steels realizes the importance of maintaining the proper furnace atmospheres. If the atmosphere carries an excess of oxygen, the work will invariably be decarburized on the surface. A rich fuel mixture will retard or prevent decarburization, and, in many cases, a small percentage of carbon may be absorbed from the fuel. If an automatic temperature control is part of the equipment, it may be assumed that the acme of perfection in heat treating equipment has been acquired, and that perfect hardening will invariably result. Nevertheless, more failures in hardening may result in the use of such equipment than without it. It might sound paradoxical to say that the most modern and approved equipment, the purpose of which is to eliminate, as far as possible, the human element, may result in defective work due to the fact that it eliminates the human element too completely. This is not the fault of the equipment, but rather of the human element in permitting itself to be completely eliminated. A recent incident will make the point more clear.

A service representative of a steel manufacturer was called into a plant to investigate a complaint that some tool steel had failed to harden uniformly. On noting that an automatic temperature control was part of the equipment, he immediately rendered it inoperative, maintaining the proper temperature by "juggling" the supply valves. At all times, he maintained a rich fuel mixture, and at no time was the fuel supply completely cut off. On being questioned as to the reason for his action, the following explanation was given, the logic of which may readily be grasped. The automatic control was of the type

(Continued on page 32)

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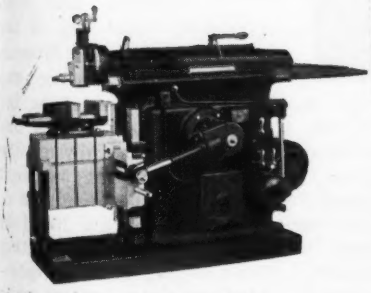

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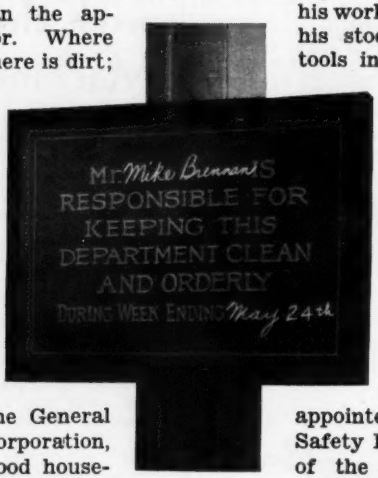
"Good Housekeeping" At the General Motors Truck Plant

Keeping clean is a task that is handled systematically in this large plant. This article tells how it is done.

By O. H. JOHNSON
Safety Director, General Motors Truck Corporation

UPON the matter of cleanliness—or the lack of it—in an industrial plant may be placed the responsibility for a number of conditions that are more important than the appearance of the floor. Where there is untidiness, there is dirt; where there is dirt, there is not only a source of rapid depreciation of equipment and a tendency toward lowering the quality of the product, but there is also a source of danger both to the plant and to the individual.



At the plant of the General Motors Truck Corporation, Pontiac, Michigan, good housekeeping is considered as of first importance. It is the belief of F. V. Hadas, who as Vice President and Assistant General Manager is responsible for plant conditions, that a disorderly department indicates a disorderly mind, and therefore a foreman who allows his department to become cluttered up with dirt, shavings, tools or equipment that are out of order, material containers in the aisles or in disorderly array, rags or waste on the machines or stock, and so on, is not the type of person who can direct his men to the best advantage. A disorderly workman may not necessarily be a poor workman, but he would undoubtedly be a better workman if his working space were clean, his stock in order, and his tools in their proper places. Accordingly, a system has been devised whereby each department in this plant is inspected at regular intervals and each department head is rated according to the condition of his department.

A rating committee has been appointed, consisting of the Safety Director, the foreman of the sweeper gang, and two men who are appointed by the Works Manager. Once a month this committee makes a survey of the plant, examining each department carefully and noting the condition of the various items that are listed on the "Factory Cleanliness Rating Chart." The foreman of each department is added to the committee while it is inspecting his department, and thus he has a voice in the rating of his own department. Each of the items on the rating chart is checked off in turn, and a penalty is imposed for

conditions that are found unsatisfactory. Assuming that a department is in first-class condition, it is given a rating of 95 plus. This rating is the highest accorded to any department, as it is considered impossible for any department of a manufacturing plant to be perfect. After the survey has been made, the penalties for each department are added together and deducted from 95, thus arriving at the rating to be accorded the department. The penalties, as listed on the chart, are as follows:

Factory Cleanliness Rating Chart

Penalty—Points First Time	Second Time	Third Time	Item	Remarks
5	10	15	Aisles	Blocked in any way that would prevent fire truck getting through.
1	3	5	Balcony	Dirty and untidy. Ascertain who miscellaneous material on balcony belongs to and report against them if not O. K.
1	3	5	Balers—Paper and Metal	Dirty and untidy.
1	3	5	Barrels	If empty barrels are setting around and not used for some definite purpose, dispose of them at once.
2	4	6	Benches	Dirty and untidy on top, in drawers and underneath on shelf or floor.
0	0	0	Benches	Broken. Report to Maintenance Department.
0	0	0	Benches	Surplus. Report to Maintenance Department at once, as no doubt can use elsewhere.
2	4	6	Bins—Stock	Dirty and untidy. Also if material on top that should not be there, such as stock that could be placed in open bins, rags, hats or caps, etc.
0	0	0	Bins—Stock	Broken. Report to Maintenance Office at once.
1	3	5	Calendar	Not more than one to be on wall in an office and this one to be placed on an inside partition and not along aisle. Do not place a calendar on factory walls outside of offices. If one is needed, a small one can be obtained and placed inside desk or table drawer.
1	3	5	Cans—Paint	Dirty empty cans must be disposed of promptly. Clean or dirty partially filled cans must be placed in proper receptacles and in orderly fashion.

Penalty—Points First Time	Second Time	Third Time	Item	Remarks
2	4	6	Cans—Waste	Must not be used as seats at desks or elsewhere. They must be placed where they will do most good.
2	4	6	Conveyor Lines	Dirty and otherwise cluttered up.
10	20	30	Department	Entire Department dirty and untidy. This penalty will be in addition to penalty affixed for blocking of fire doors and other major items.
1	3	5	Desks	Untidy. Papers or binders, etc., on top. Top must be clean. Drawers dirty and untidy. Clips, pins, pencils, etc., must be placed in small boxes so they will not be scattered through drawers. Take personal stuff home.
0	0	0	Desks	Needing repairs. Report to Maintenance office. Report all surplus equipment of this kind to Maintenance office.
5	10	15	Doors—Fire	Blocking in any manner, so they cannot be operated. These doors simply must not be blocked in any way.
1	3	5	Extinguishers—Fire	Dirty extinguishers. Also those not in proper location and needing attention otherwise.
5	10	15	Extinguishers—Fire	Blocked by stock, etc., so they cannot be reached easily. If blocked with stock the department foreman should notify stock department from which stock was delivered or have his own men relocate it at once. Penalty will be placed against both stock department and department in which extinguisher is located, if the slightest negligence is disclosed.
1	3	5	Electrical Fixtures	Dirty, etc. Report any surplus to Electrical Department, as can no doubt use elsewhere.
10	20	30	Entire Department	Dirty and untidy. This penalty will be in addition to penalty affixed for blocking of fire doors and other major items.
1	3	5	Equipment—Maintenance and Shop	Dirty or left in careless condition on benches, floor, etc. Also equipment left on job after completion.
2	4	6	Escalators	Dirty and otherwise disclosing inattention.

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1	3	5	Fans—Electric	If sitting on top files, etc., when not in use during winter, spring or fall seasons. Should be in Electrical Department with tag attached showing name of office to which fan belongs. If left sitting in office all seasons, fans never get maintenance attention they should have at least once a year.
5	10	15	Fire Aisles	Blocked in any way that would prevent fire truck getting through. These aisles must be kept clean.
1	3	5	Fire Extinguishers	(See extinguishers.)
2	4	6	Floors	Dirty floors will be called dirty when it is obvious that dirt is there through neglect and is not clean dirt just made with no opportunity to clean up. Also floors with tobacco spit on them. No excuse for this, so it is not permitted.
1	3	5	Gloves	On floor, top benches, desks, lockers. Hanging on partitions, ledges, etc. In fact, any place except in lockers or in drawers.
3	6	9	Gloves (Oily)	Oily gloves must be placed in tin boxes. If elsewhere penalty will be in force. This is a dangerous fire hazard.
1	3	5	Heaters—Buffalo	Dirty around valves, ledges, etc.
1	3	5	Jigs and Fixtures	Dirty or piled in careless fashion.
2	5	8	Kilns—Dry	Dirty or untidy.
1	3	5	Kilns—Dry	Needing repairs. Report to maintenance as kilns must not be neglected.
1	3	5	Ladders	Unsafe, unpainted, dirty. Not piled neatly or placed against fire door or any other place deemed improper.
5	10	15	Liquids (Highly inflammable or explosive)	Left in uncovered cans, on top benches, bins, etc. Must be covered up and put in safe place.
1	3	5	Lockers	Dirty and untidy. Clothes must be hung on hooks. Gloves, clean rags and other miscellaneous items of this nature must be placed on shelf if one, and if not, piled in neat fashion on locker floor, not just thrown in heap.
0	0	0	Lockers	Broken. Report to Maintenance Office.
1	3	5	Lofts	Dirty and untidy. (Notice to inspectors.) Find out who owns the material in loft and penalize him.

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Penalty—Points First Time	Second Time	Third Time	Item	Remarks
1	3	5	Lumber	Lying on floor in untidy manner, piled uneven, etc.
1	3	5	Miscellaneous	Rags, papers, wood, etc., stuck behind pipes, boxes, desks, benches, etc. Paper stuck on walls, screen partitions and in fact any place except on bulletin or cleanliness rating boards. Trucks scattered around a department instead of being lined up properly consistent with layout of factory. Empty cans sitting around. Aisles cluttered up with miscellaneous items. In fact, any miscellaneous disorder along these lines that tends to make for an untidy department. Stock not properly labeled or tagged.
1	3	6	Machinery	Dirty and untidy, principally when not in use. Even when in use most machines can be kept tidy and fairly clean.
0	0	0	Machinery	If leaking oil, report to Maintenance Office.
2	4	6	Ovens—Bake	Dirty and untidy.
1	3	5	Overalls and Other Shop Garments	Thrown carelessly in stock bins, on top boxes, benches, desks, files, etc. Thrown on floor or in fact any place that can be deemed untidy. Should be placed in lockers, or racks, etc., provided for clothes, caps and hats.
1	3	5	Boxes—Tote	Dirt in them or sitting around on floor in careless fashion. Sitting on top of bins or any other place not in keeping with good housekeeping.
1	3	5	Partitions	Untidy through signs, papers, material, etc., being hung on them.
1	3	5	Racks—Stock	These racks must be kept free from miscellaneous items that may be placed in them. If racks need repairs, report to Maintenance Office.
1	3	5	Rags	**Dirty Rags** on benches, floor, pipes, ledges, etc. Stuck behind pipes, desks, benches, etc. In desks, bench drawers, bins, etc. **Clean Rags** on top desks, in bins, or

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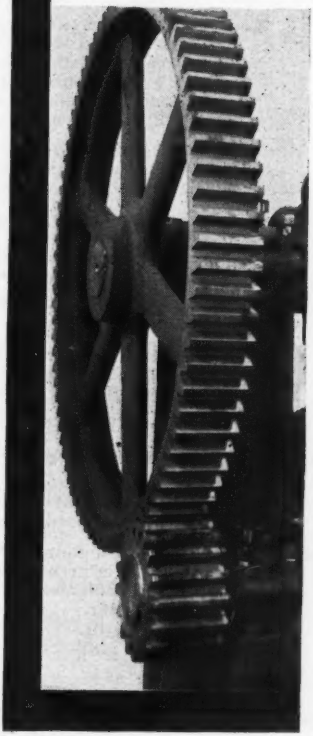

Charles E. Crofoot Gear Corp.
South Easton, Mass.
Arlington Machine Co.
St. Paul, Minn.
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Syracuse, N. Y.
Worcester Gear Works
Worcester, Mass.
Massachusetts Gear & Tool Co.
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For ten years the use of Formica gears — in proportion to the total number of gears used—has increased steadily.

The salesman finds machinery easier to sell with Formica gears because it operates more quietly; the workman who operates the machines can do more and better work because his nerves are in better condition and he is not so likely to misunderstand orders; the maintenance man does his job better because quiet machinery sounds as though it were better taken care of.

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Penalty—Points First Time	Second Time	Third Time	Item	Remarks
				top bins and in fact any place except in lockers and drawers.
3	6	9	Rags—Oily	Oily rags left in lockers, drawers, or any place except in tin boxes or cans. This is bad fire hazard.
1	3	5	Roof	Leaks, dirty, etc. All leaks must be reported to Maintenance Office at once.
1	3	5	Salvage Material	Material of this nature must be promptly sent to Salvage Department. It simply must not be left laying around factory indefinitely.
1	3	5	Signs	Signs of any nature must be hung neatly or if not hung where they are plainly visible, they should be reported to Maintenance Office at once. Signs needing repainting should be reported to Maintenance also.
1	3	5	Toilets	Floors dirty, walls dirty and scribbled on, unclean toilet equipment of all kinds. Leaky faucets, etc.
2	4	6	Tools	Thrown carelessly in kits, on racks, benches or floor. Not arranged neatly for efficient handling. Dirty and otherwise neglected.
1	3	5	Tracks ("Railroad Beds")	Dirty between ties, etc.
1	3	5	Windows	Dirty, broken or cracked. Penalty applies only when management permits spending of money for replacements.
1	3	5	Valves	Leaky and dirty.
1	3	5	Writing	On walls, control boxes, benches, windows, etc.
1	3	5	Yards	Untidy and dirty R. R. yards and material or stock sections of yards.

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O. H. Johnson.
A. Kaiser.
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The fact that some departments must necessarily cover much more territory than others, involving an added burden of supervision, is taken into consideration and allowance is made for the larger departments by dividing the departments into two classes. Class No. 1 consists of the departments that cover comparatively large amounts of floor space, and Class No. 2 includes the smaller departments of the plant.

Each department is provided with a "cleanliness rating board," painted

As Much a Matter of Engineering as of Manufacture To Produce GOOD GEARS

FELLOWS SERVICE carries beyond the sale and tooling of equipment to cut high-accuracy gears. It is more concerned with your satisfaction with Fellows-cut gears than it is burdened in maintaining the operating efficiency of Fellows Gear Shapers. They so rarely get out of condition that "trouble shooting" is principally a matter of engineering to meet special gear operating conditions.

Every gear maker must realize that FELLOWS SERVICE seeks only the opportunity to demonstrate, in practice, that FELLOWS GEAR SHAPERS AND ORIGINAL FELLOWS GEAR SHAPER CUTTERS will continuously DUPLICATE a satisfactory gear design at the lowest possible cost.

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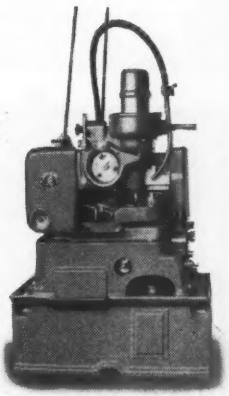
GEAR SHAPERS



Fellows High Speed Gear Shapers will put your gear cutting on a 1931 economy basis.

black and bearing the number of the department and the name of the foreman, with a space upon which the cleanliness rating of the department can be marked with chalk. As soon as the ratings have been determined, these ratings are marked up on the boards and a typewritten sheet showing the ratings for all departments is hung on each board so that all may see the ratings and place standings of the various departments.

In order to develop a spirit of co-operation and personal interest in the condition of the various departments, one man in each department is appointed by the foreman, each week, to be responsible for the condition of that department. He is not actually expected to do any actual sweeping or cleaning, but he is expected to call the attention of the foreman to conditions that should be remedied, neglect on the part of the sweepers, carelessness on the part of stock-handlers, and so on. Each man in the department is given this job in turn, and zest is added to the task by the spirit of good-natured rivalry that has been developed among the men. Beside each "cleanliness rating board" is placed a second board, upon which the foreman writes the name of the person who is to be responsible for the condition of the department during the ensuing week.

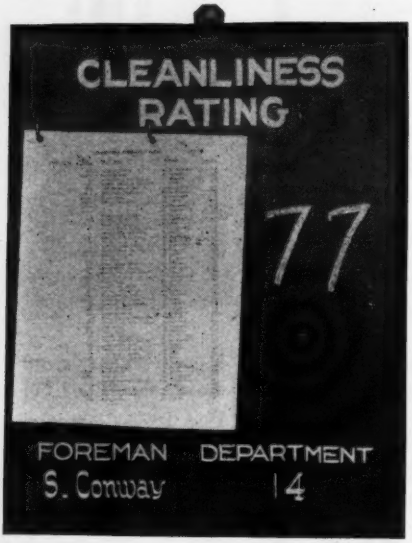
The competition created between departments has made a marked difference in the safety record during the past year. That fact, together with an unusual amount of departmental pride in matters of cleanliness, has made the rating system a complete success.

DEPARTMENTAL CLEANLINESS RATING
CLASS NO. 1

Place Stdg.	Dept.	Dept. Name	Foreman	Rating
1	17C	Export Boxing Dept.	R. Bliss	95+
	30	Receiving Inspection	R. Kimler	95+
	75	Loading Dock & Warehouse	G. Lane	95+
2	11AC4	Chassis Assembly	J. Seaton	94
	11AC3	" "	J. Seaton	94
	41	Receiving and Unloading	H. Dennis	94
3	24E	Cab Paint Shop	S. P. Dyson	93
	24E	Truck Paint Shop	E. Leesender	93
	69	Center Sec. S. Blvd. Bldg.	J. A. Murray	93
	45SF11	Wood Stock	F. Haynie	93
	47	Lumber Storage - Rough	A. Fitzgibbon	93
	25E	Trim Shop	J. Miller	93
4	22E	Body Upfit Before Paint	A. Wilberg	92
5	10AF1	Frame Dept.	H. Van Camp	91
	24E	Coach Paint Shop	K. Rathun	91
	19E	Body Panel	R. Furgason	91
	11AC1	Ave. of all his depts.	H. B. Merritt	90
	21D	Sheet Metal	Ed. Lucas	90
	15B	Body Mounting - Coach	H. D. Wile	89
6	20D	Mill Room	H. McCallum	88
	60	Power Plant	W. Lilly	88
7	58	Custom Body Dept.	J. Scherbing	86
			W. Eichenger	86
8	27E	Body Final Upfit	E. Sommer	85
9	11AC2	Chassis Assembly	F. Opperman	84
10	23E	Body Assembly - Truck	E. Maul	83
11	27AB1	Body Upfit - Truck	J. West	82
12	18E	Body Framing	W. Griffy	80
	14B	Chassis Final - Truck & Cab	S. Conway	80
	51	Maintenance - General	R. Wenzell	80
	62	Police, Firemen & Sweepers	A. Kaiser	80

Note:- Class 1 includes all departments having comparatively large amounts of floor space.

95+ is the maximum rating given to any department. It is considered impossible for any department to be perfect.



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Self-tapping Screws are used on 85% of the industry's production

Millions of fastenings are made in a year's production of a car or body. The manufacturer cannot afford to pick fastening devices in a haphazard manner. He must know to the fraction of a cent which fastening device is the most economical to use which one offers the easiest and quickest way of making metal assemblies.

It is significant that Self-tapping Screws are used for metal assembly on 85 per cent of the automotive industry's production. The industry's saving through the use of these unique Screws is enormous. One body builder alone saved over $150,000 in a single year by using Self-tapping Screws in place of machine screws and other devices for making fastenings to sheet metal. He gained more secure assemblies, too. For scientific tests show that fastenings made with Self-tapping Screws hold better than either machine screws or bolts and nuts under tension, shear and vibration stresses.

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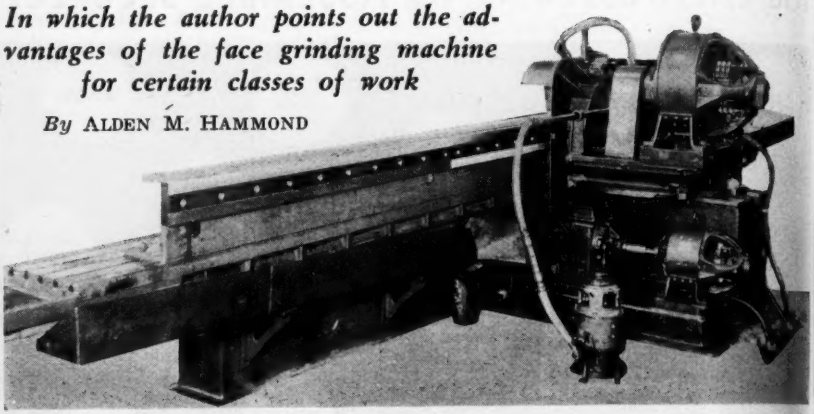
"To Grind Or Not To Grind"

In which the author points out the advantages of the face grinding machine for certain classes of work

By ALDEN M. HAMMOND



30 x 216-in. Diamond face grinding machine grinding shear blades at plant of Alan Wood Iron & Steel Co., Joy Rock, Penna.

THERE are any number of manufacturing plants distributed throughout the good old U. S. A. where the subject of producing smooth, flat surfaces quickly has never received the attention it deserves. And, in too many of these cases, the time comes frequently when such an operation becomes the "neck of the bottle," preventing an even, steady flow of parts to the assembly floor.

The face grinding machine is but one of several machines which are in no sense "special" machines, as the term "special" is commonly understood; i. e., they are not designed for finishing one particular type of piece and no other. On the other hand, they might be termed "semi-special," if that term were understood to mean a machine which might not be a necessity to every shop, but which was so designed that it would prove exceptionally worth while where the type of work to be finished were suited to it. Like others in this class, the face grinding machine would be as much of a luxury for some shops as a Rolls-Royce would be for a machinist's apprentice, but to other shops it would be as important as his pay day.

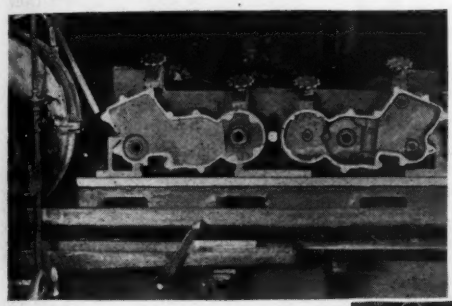
What Manner of Machine Is This?

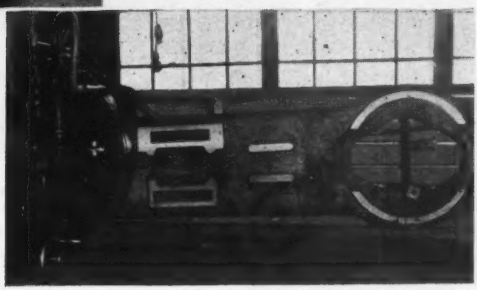
Fundamentally, the face grinding machine is composed of a reciprocating table, to which the work is bolted, passing across the face of a "cup" grinding wheel. Actually, the 1931 machine, as manufactured by several different firms, is a large, rigid machine tool with a table which is hydraulically driven at a high rate of speed back and forth in front of a large segmental abrasive wheel. A pump and reservoir system provides an ample supply of coolant at the point of contact between the wheel and the work, preventing "burning" of the work. The speed of the table is varied at will by the operator to accommodate different types of work, difference in metals being finished, or the depth of the cut. The work can be fed to the wheel either automat-

ically or by hand, as the operator desires.

What Is Different About Face Grinding?

There is a marked difference between the methods of producing a flat surface by the use of a cutting tool and by the use of a face grinding wheel. With the usual type of cutting tool, it is customary to take two cuts; one for "roughing," to remove the scale and the bulk of the stock, and the other to finish the work to the desired dimensions. With the face grinding machine, in quite the opposite manner, the work makes innumerable passes across the face of the grinding wheel, each pass removing a little of the surface. As a consequence, a flat surface is quickly obtained, regardless of scale. However, this point is important — the face grinding machine should not be considered as the proper machine to use for removing large amounts of metal from the face of a forging or casting. The particular mission of the face grinding machine is to produce flat surfaces quickly.





(Above)—Finishing flat surfaces on an 18 x 48-in. face grinding machine. (Right)—A good example of the type of work that is particularly adaptable for face grinding. Young Pump Co., Michigan City, Ind.

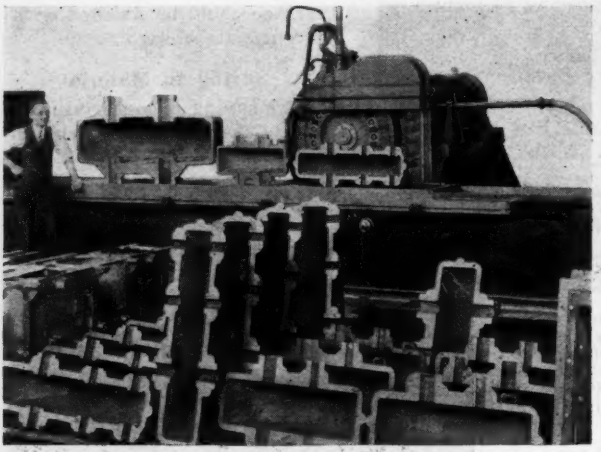
Saving of Time

The saving of time is a most important item in the use of the face grinder. Where the only requirement is that a flat surface must be produced, without regard for dimensions, the amount of time required is dependent upon the evenness of the face of the work. If the work were perfectly flat to begin with, the surface could be finished within a minute or two.

Saving In Material

The saving in material made by the use of the face grinding machine usually comes as a surprise to those who are having their first experience with the machine. It may even be considered as insignificant until it is given careful thought. Consider, for instance, the ordinary allowance for "finish" on cast iron parts. This allowance varies, depending on the size and shape of the casting, from 1/8 or 1/4 in. to as much as 3/8 in. in rare cases. Where the amount of stock on castings is not carefully checked, the tendency is to leave more rather than less than the amount specified, and the excess material has to be removed. Where the work is to be finished by the use of a cutting tool, it is necessary that enough stock be left so that the tool will not slide over the scale in low spots. This al-

lowance is unnecessary where the work is to be finished by face grinding. Consequently, it is common practice to reduce the allowance to a bare minimum, usually $\frac{1}{16}$ in. where dimensions are important. One large manufacturer had all "allowance" figures removed from drawings of parts such as motor bases, where the flat surface was the essential rather than the actual thickness of the part to be machined.



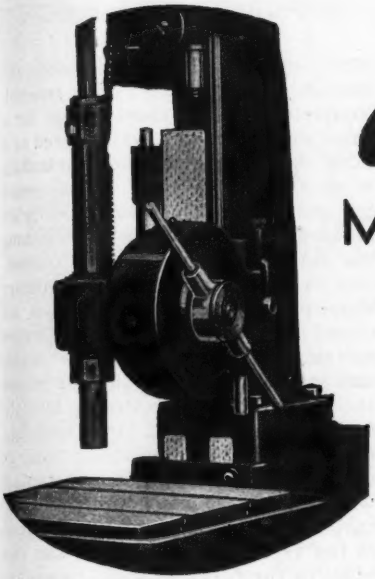
Face grinder at work in plant of Baker-Perkins Co., Saginaw, Mich.

This saving in material may be less than a pound of metal per casting, but, multiplied by several hundred castings, it becomes an item to be reckoned with. Or it may be several pounds on a fewer number of pieces and still be important. Many users of face grinding machines have found that it paid to alter patterns, just for the sake of the material saved. This item becomes more important where the work is of brass or aluminum, or where all castings are purchased from a separate foundry. The reduced cost of shipping, due to the reduction in weight, is also to be considered. In addition, it frequently occurs that there are fewer "rejects" on account of hard spots in the castings, and it should be remembered that there will be no chipped or broken edges where the wheel leaves the work.

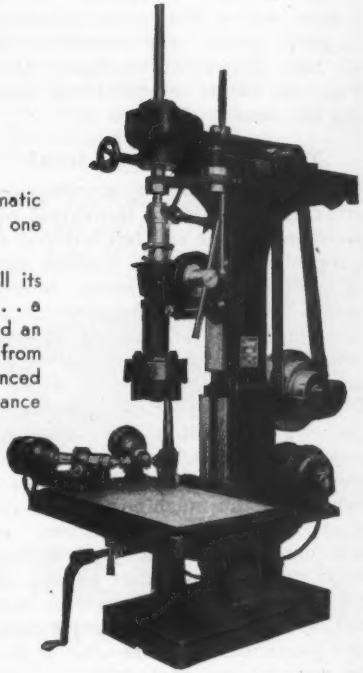
The Matter of First Cost and Upkeep

Everything is relative—and savings in material and time must be considered along with investment, depreciation, and upkeep charges. Up above we said that the face grinding machine was, at times, an expensive luxury, and we repeat it here in connection with the item of machine charges. At times it is an economy to machine parts by the use of methods which are less efficient than the best, rather than to have an idle machine on the floor, eating up the profits on the other machines. The face grinding machine, then, must be busy a satisfactory number of hours during the year or it will obviously be uneconomical. On the other hand, it can well be idle a good many hours and yet prove a sound investment where time and material savings are sufficiently large.

Wheels have to be replaced after they have been used to a small fraction of their original thickness; coolant supply must be maintained, and the oil supply and other items watched, but, on the whole, the cost of operation and maintenance of the face grinding machine will compare favorably with the costs on other types of machine tools. One operator is re-



Avey - matic Means More Than Automatic



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quired to be in constant attendance when the machine is operating, and good practice calls for the wheel feed —and frequently the table travel—to be controlled by hand to suit the particular conditions; heavy cuts and partial travel when removing "high spots" and lesser feed and longer travel as the finished surface increases in size.

If the work is heavy, a helper may be needed in setting up, but usually a chain hoist and jib crane will serve the table area. A magnetic chuck is of infinite value when grinding certain kinds of work. An operator can be quickly trained to operate the face grinder, and is often more satisfactory if taken "green" and trained to operate that particular machine. Otherwise, old habits of speed may handicap the results obtained.

To Grind Or Not To Grind?

Whether to finish by grinding or by other methods is an individual plant problem; no one can tell without considerable study which method should be used. Common sense, however, makes it imperative for machine shop officials to know what equipment is available and which method is most adaptable for the task in mind. In this day and age most machine tool builders are willing and anxious to guarantee production after making a thorough study of the conditions under which the machine is to be operated. Their representatives, also, will usually be found glad to match their time against that of the prospective purchaser in a careful examination of the facts as they relate to any particular problem—but it should be remembered that facts, and facts alone, are the best guide in making purchases of machine tools. The machine that returns the most for each dollar invested in one plant may be a total "flop" in another.

Furnace Atmospheres

(*Continued from page 14*)

which operated the valves when the desired temperature was reached, completely closing them except for a small amount of gas, which acted as a pilot flame to continue combustion when the valves were again opened by the control. When tool steel reaches a temperature approaching the hardening range, it is in a condition to oxidize if exposed to ordinary atmospheric air. As the valves are closed by the control, the difference in temperatures between the inside and the outside of the furnace causes the outside air to be drawn into the furnace through all the openings, however small, thereby permitting an excess of oxygen to come in contact with the heated steel, promoting decarburization. By hand manipulation of the valves, a rich mixture was supplied to the furnace at all times, and as the valves were manipulated to provide a slow temperature rise, it was not necessary to completely close the valves to prevent overheating of the work.

On the recommendation of the service representative, a valve-controlled by-pass was installed in both the fuel and air lines, these valves being left open at all times, so that the automatic control cannot, at any time, completely cut off the fuel supply. In this manner, a non-oxidizing flame is maintained in the furnace at all times, independent of the automatic control.

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Machining Parts For "Wasp" and "Hornet" Engines, III

The concluding section of this article, in which the machining of several different parts is discussed

By HOWARD CAMPBELL

THE link rods for the Pratt & Whitney aircraft engines are of I-section design, drop forged from chrome nickel steel, and are finished all over. The first machining operation on these rods is that of straddle-milling the ends, which is accomplished by clamping two of them at a time in a double fixture on a Sundstrand "Rigidmil," as shown in Fig. 17, and removing the stock with a set of four side milling cutters. The fixture is of the rotary-indexing type, making it possible to swing the fixture around, after one end of the pair of rods is milled, and mill the opposite end. The allowance on this operation is plus or minus 0.001 in., and an average production of 110 rods in 10 hours is obtained—11 rods per hour.

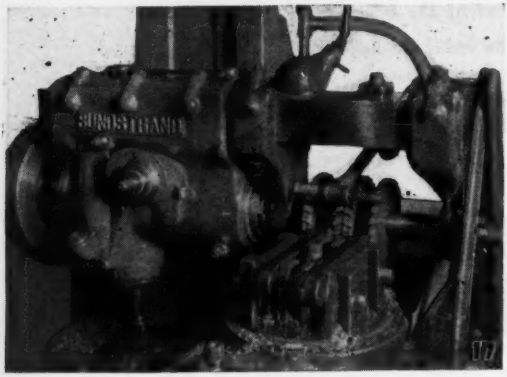


Fig. 17—Straddle-milling ends of link rod forgings.

The operation shown in process in Fig. 18 is that of machining the radius which is formed by the junction of the L-section with the cylindrical end of the link rod. The tools consist of two Barnes All-Geared drilling machines, equipped with two-spindle heads and "Lovejoy" four-blade boring tools. Two jigs are provided, each holding two rods at exactly the right distance to hold the finished part within the necessary limits of 0.005 in. The rods are roughed with the tools in the machine at the left, then they are transferred to the machine at the right, where they are finished. Machining the rods at this point makes it possible to hold them within the required limits as to weight. The production on this operation is 120 rods per day.

In the next operation the end of the rod is machined to cylindrical form by shaping in a Fellows gear shaper, as shown in Fig. 19. The two pins on

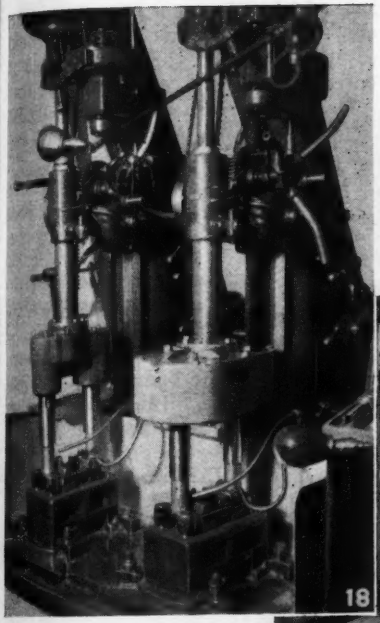
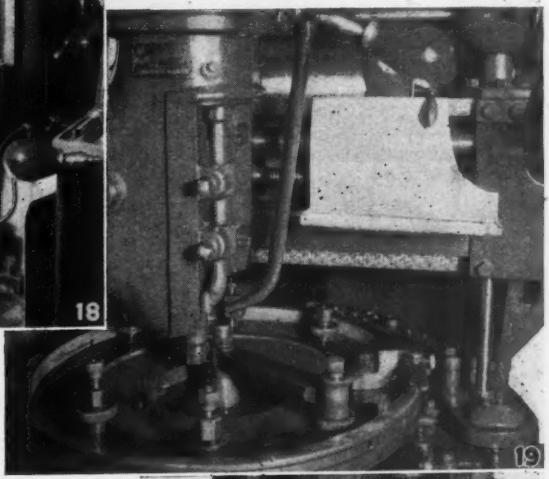
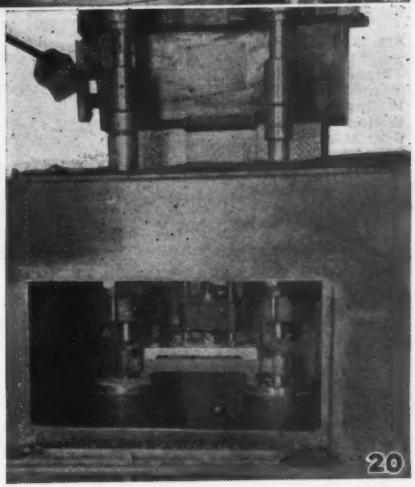


Fig 18—Machining the radii at the junction of the I-section with the cylindrical end of the link rod. Fig. 19—The ends of the rod are machined to cylindrical form by shaping in the Fellows Gear Shaper. Fig. 20—The bronze bushings in the link pins are bored to size in this diamond boring machine. Two holes are finished in each rod at a rate of 40 rods per hour.

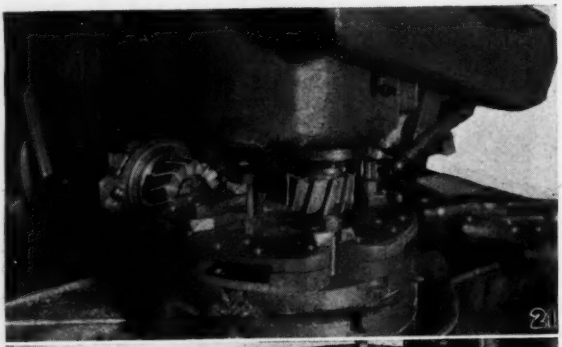
which the rod is located are mounted in the machine-table so that one end of the rod will be in the exact center of the rotary table. As the table revolves, the shaping cutter moves rapidly up and down, removing the stock and leaving a smooth, cylindrical surface. Each rod is roughed on one machine and finished on another, the roughing operation leaving $\frac{1}{64}$ in. of stock for finish, and the finishing operation reducing the stock to within minus 0.002 in. of the drawing dimension. Eighteen rods per hour are machined in the roughing operation and 20 rods per hour in the finishing operation.

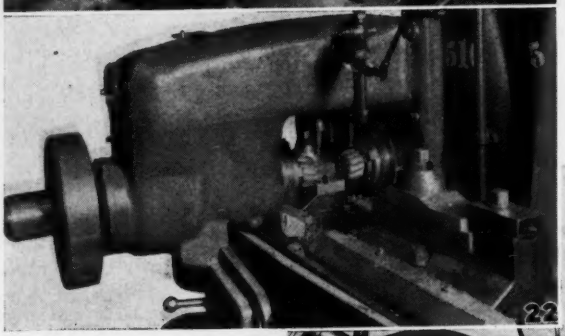
Practically the last operation on the link rod, performed after the rod has been finished all over and the bronze bushings have been pressed into place in the ends of the rod, is that of boring the bronze bushings to size. The rod is clamped in place under the spindles of a "Coulter" diamond bor-





ing machine, and both ends are bored at the same time with diamond boring tools. The spindles revolve at a speed of 5,000 r.p.m. under a copious flood of coolant, consequently it is necessary to have the work and tools enclosed to prevent the coolant from being thrown upon the surrounding equipment. The tools can be seen in operation, however, by looking through the "window" in front of the housing, as shown in Fig. 20. The tools feed through the bushings at a rate of 0.00075 in. per rev. of the spindle. The large end of the rod is bored to 1.3745 in. and the opposite end is bored to 1.0605 in., the limit on either dimension being 0.0005 in. A glass-smooth finish is produced on the interior walls of the bushings, and 40 rods are finished per hour. Approximately 5,000 rods are machined before it is necessary to change the tools.





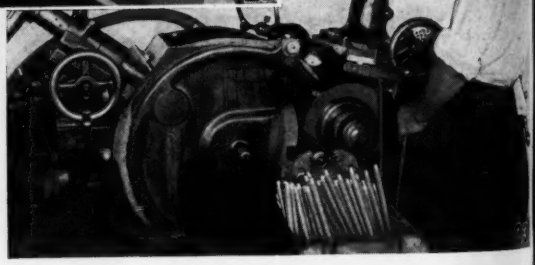
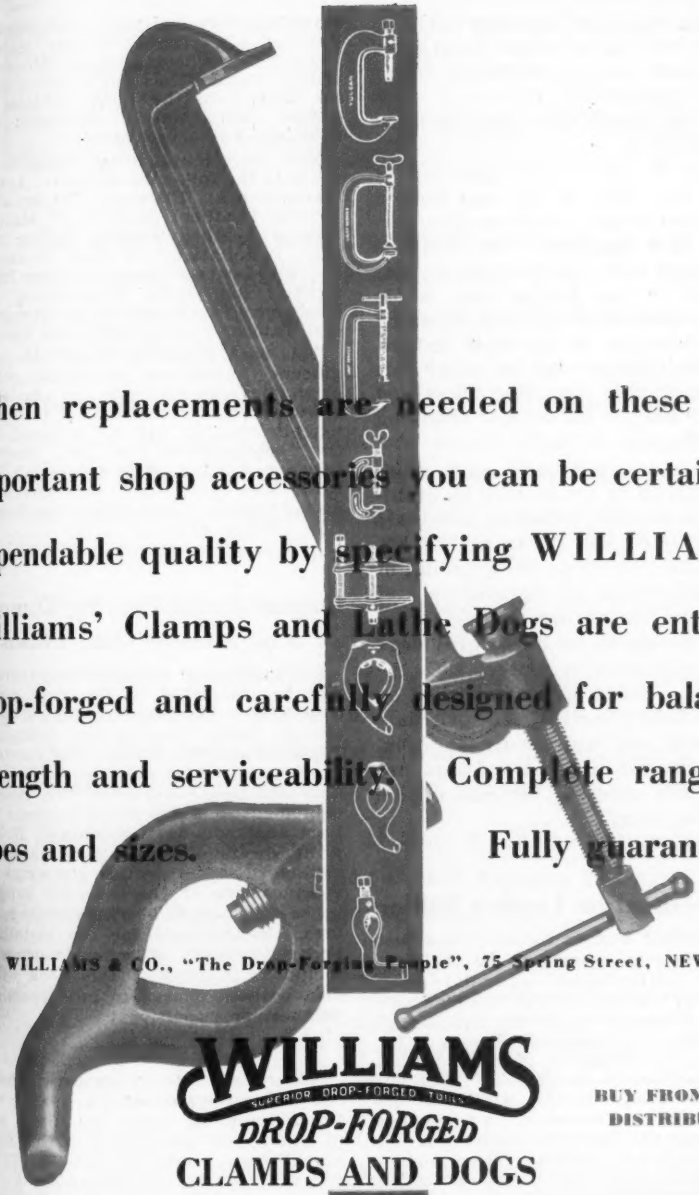


Fig. 21—Machining counterweights for crankshafts. Three surfaces are finished in this operation. Fig. 22—Milling the sides of the rear section of the crankshaft. Fig. 23—Cylindrical work is finished to size by grinding in the centerless grinding machine.

In Fig. 21 is shown the operation of finishing the inner radius, outer radius, and a bevel on the edge of the crankshaft counterweight. This operation is performed on a Sundstrand "Rigidmil," equipped with three cutters, as shown in the illustration. Eight pieces are clamped at one setting on a fixture on a rotary table, with the cutters set so that the cutter on the horizontal spindle mills the outer surfaces as the table revolves, while the cutter on the vertical spindle



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mills the radius on the inner surfaces and the third cutter, which is set at an angle, mills the bevel on the upper edges. Approximately ⅛ in. of stock is removed from each of the inner and outer surfaces.

Figure 22 shows the operation of milling the sides of the rear section of the crankshaft, which is also performed in a Rigidmil. The machine is equipped with two fixtures, so that the piece in one fixture can be in process while the operator is changing the work-pieces in the other fixture. With two cutters—one on either side—the machining operation takes just about as long as the task of changing the work.

Wrist pins, push rods, and other cylindrical parts are finished by grinding in centerless grinding machines similar to the one shown in Fig. 23. The illustration shows the grinding of push rods, which are finished only at the ends. By setting the regulating wheel housing to an angle of 1 deg., the piece is kept in contact with the end stop. Sizing is accomplished by the "in-feed" method of grinding. Each push rod is ground back $\frac{5}{16}$ in. from each end, and the rods are finished—both ends—at the rate of 170 pieces per hour.

New Manual on Leather Belting

The leather belting industry has just issued what is claimed to be the first and only authoritative, up-to-date book on leather belting. The book, which is titled "Treatise on Leather Belting," was compiled by George B. Haven, S. B., Professor of Advanced Machine Design at Massachusetts Institute of Technology, and George Swett, S. B., of the same school, and represents a work that took these two men the better part of two years to accomplish. The information contained in the book was boiled down from a vast quantity of data that has been accumulated by leather belting manufacturers and users, together with data of tests that had been made in engineering schools such as Mellon Institute, Cornell University, and so on. In its final form the book contains 220 pages. It is amply illustrated with drawings and photographs.

The book contains ten chapters, devoted to the following subjects: Leather Manufacture; Physical Properties of Belting Leather; Methods of Manufacture of Leather Belting; Belting Practice; Installation and Care of Leather Belting; Leather Belts on Motor Installations; Belt Drive Engineering; Belt Research; Specification and Inspection, and Tables; Nomographs, and Plots.

This book should be invaluable to engineers, production executives, master mechanics, and everyone else who is concerned with the operation of belt-driven machinery. It can be obtained from the headquarters of the American Leather Belting Association, 41 Park Row, New York City, or through any manufacturer member of that association. Price, $1.50.

Orange Roller Bearing Company Engineering Data Sheets

Designing and maintenance engineers will be interested in the new general catalog of roller bearings put out by the Orange Roller Bearing Co., Orange, N. J. The catalog describes and illustrates the four distinct types of roller bearings and includes pictures of the types of equipment to which these bearings have been adapted. It also contains 76 blueprint sheets of engineering data, consisting of cross section drawings and specifications of the complete range of types and sizes of bearings made by this firm. Instructions for the installation and adjustment of roller bearings are included. A copy of this book will be sent without charge to any mechanical engineer or executive.

Advertisers like to know whether or not their advertisements are being read. When inquiring about machines, tools or equipment advertised in this magazine, please mention MODERN MACHINE SHOP. Your cooperation will help to build up a bigger and better magazine for your own benefit.

From A Wrist Watch To A Car Wheel

The chuck is the most important element in any mechanical operation. From a wrist watch to the running gear of a freight locomotive—it's the heart-beat of the job. . . . . .

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While an old and a new chuck look very much alike outwardly, yet one is just a chuck and the other a real aid to production. New chuck models more rigidly support work against tools or tools against work; keep more accurate alignment; production is speeded up, and tool breakage is kept down. .

The complete efficiency of any machine depends upon its chuck. New ones should replace old ones whenever they have outlived their day. . .

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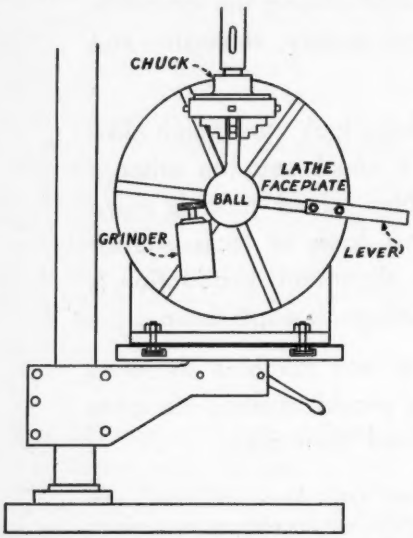
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Turning and Grinding Balls in a Drill Press

By CHARLES KUGLER

IN a small repair shop in which the equipment consists of a drill press, shaper, and a lathe with no compound rest, it was found necessary to manufacture a number of balls of four-inch



Drill Press Set Up To Grind Balls

diameter. Lack of a compound rest made it impossible to do the job satisfactorily in the lathe, so the drill press was rigged up and the job was done as follows:

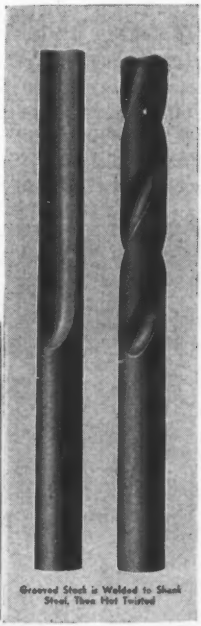
A stud was fitted to the lathe faceplate, then a hole was bored in the vertical face of an angle plate for a slip fit on the stud. This made it possible to revolve the face-plate on the angle plate, a section of bar iron, bolted to the face-plate, serving as a lever. This outfit was then clamped to the table of the drill press, as shown in the illustration. The balls were rough turned in the lathe, then the spindle to which each ball was attached was chucked in the drill press, to the spindle of which a lathe chuck had been fitted, and the ball was finish turned. The pieces were then hardened, after which they were ground by means of a small electric grinder, bolted to the face-plate as shown. The proper form was finished on the ball by revolving the face-plate vertically one-half of a revolution, the work, meanwhile, being revolved at a high rate of speed by the drill press spindle. The finished job was entirely satisfactory.

Boring Large Work With a Drill Press

By AVERY E. GRANVILLE

IN spite of all that the old-timers tell us, there are still some real mechanics left, although we may have to go to the small, out-of-the-way shops to find them. My work takes me all over the country and into many shops tucked back in the hills of what may be called the "back-woods," and in such shops I find many ingenious devices that have been worked out to make repairs on oil-well and gas-well

ROLLED GROOVED STOCK HOT TWISTED



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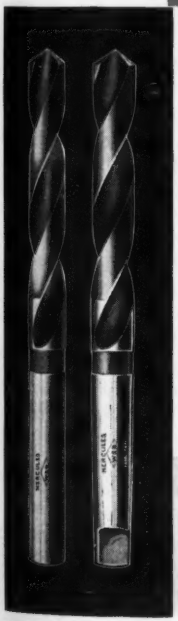

Bar stock rolled to grooved shape in long lengths at the mill, under closely controlled temperatures, builds-in a uniformity of grain structure and cross section practically unattainable by other methods. The subsequent hot twisting further adds to the texture of the steel and preserves the natural grain structure which contributes the unusual strength and durability of Hercules drills.

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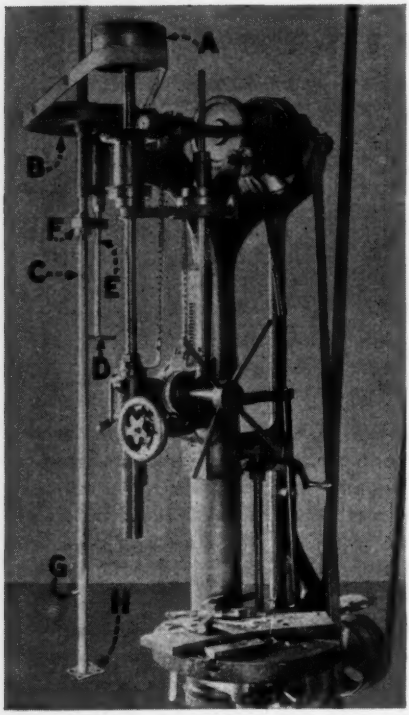
machinery, where each new job is a problem in itself.

One such shop is located in a district where quite a number of gears and pulleys from four to six feet in diameter are used. Subject to heavy strain and hard service, these parts soon wear out and have to be replaced



Drill Press Attachment For Boring Pulleys and Gears.

with new ones. As a rule, most of the new ones have to have the hubs bored to fit the shafts upon which they are operated. Sometimes the hubs are bushed, sometimes they are babbitted, and sometimes bored out of the solid cast iron. In any case, the boring presents a problem, when the equipment is limited to a few drilling machines and a lathe or two and with nothing having more than a 36-in. swing. Some shops rig up a boring bar to be run from an extension of a lathe spindle, but while it may be done, the process offers a number of difficulties. One such shop solved the problem in a very simple and ingenious manner by the use of the equipment shown in the illustration.

To a large drill press is attached an auxiliary spindle, carried by a bracket that is bolted to the top of the column. A pulley **A**, keyed to the upper end of the drill spindle, is belted to the pulley **B** on the upper end of a splined sleeve through which the auxiliary spindle slides. A taper shank boring bar **C** fits into the lower end of the auxiliary spindle in the usual way. The boring bar is fed vertically by means of the hand wheel **D** which operates the screw **E**, running through a nut in the piece **F**, in the opposite end of which the sleeve is held by collars above and below. A cutter is located in the bar at **G**, and the lower end of the bar is steadied by means of a bushed floor-plate **H**.

When it is desired to bore out a piece of work, the auxiliary spindle is removed and the pulley or gear is laid flat on the floor, where it is aligned with the boring bar. The bar is then inserted into the spindle and the cutter is set for the diameter desired. With the drill press furnishing the power, the bar is fed down through the hub. If the hub is flush with the edge of the rim, the work is blocked up so as to afford clearance for the cutter and to allow the chips to drop out. If the hub is short, no timbers are used. As a rule, the work is heavy enough so that no clamps are needed, but when necessary, clamps are used and the bolts are run through the floor.

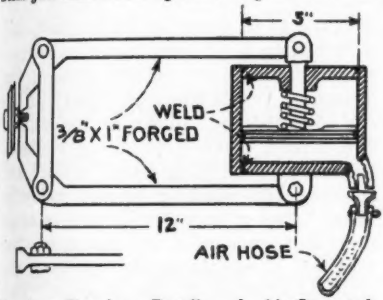
The boring device does not interfere

with the regular use of the drill press, as the attachment is freed by throwing the belt off the pulleys.

Air-Operated Bolt-Clipper

By JOHN MCCULLAGH

WORKERS in car shops are all familiar with the laborious and time-consuming task of cutting the ends off the bolts after assembling. This job has been speeded up and made



Drawing Showing Details of Air-Operated Bolt-Clipper.

much simpler, in a northern railway shop, by the use of the tool illustrated in the drawing.

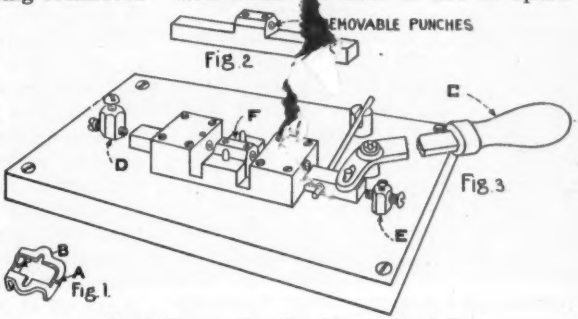
The unit consists of a five-inch air cylinder of the single-acting type, to which is attached two jaws, one being hinged on a pin at the bottom of the cylinder and the other being connected to the piston. The free ends of the jaws are forged to form the cutting edges which are necessary to clip the ends of the bolts. Power is supplied from the shop air line. To operate, the jaws are placed in position over the end of the bolt to the nut, then the lever is turned and the air is let into the cylinder. As the piston moves out, the end of the bolt is severed. The device is easily handled and is almost instantaneous in operation.

Punching Fixture For Small Part

By CHAS. H. WILLEY

SOMETIMES it is possible to make a simple fixture with which accurate punching operations may be performed by hand quicker and better than would be possible with the power press, if the work is not too thick. Hand fixtures are often much faster and are always much safer. The fixture shown in the illustration was designed for the purpose of punching two holes in the brass part indicated as Fig. 1. The holes, indicated at **A** and **B**, were required to be in perfect alignment, as they were to be tapped to receive 0.080 in. thread jewel screws.

The slide in which the two punches are carried is shown in detail in Fig. 2. The slide is worked back and forth in the fixture by means of the hand lever **C**, Fig. 3, a hole being punched with each movement of the slide. The part to be punched is saddled upon the slide at **F**, and the depth of the punch, either way, is regulated by the stops **D** and **E**. A piece of tempered drill rod is used as a spring rod to maintain the slide in a neutral position when the slide is not in operation. The piece is stripped from the punches easily, although a stripper could easily be designed, if necessary. The stock is 0.025 in. soft brass.

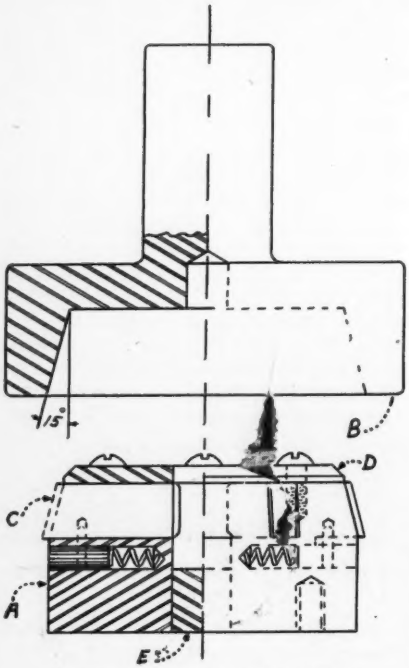


Hand Fixture For Punching a Small Part

Die For Stamping "Toddle Tops"

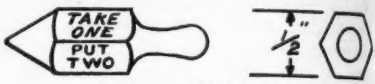
By HARRY S. TAYLOR

THE die shown in the accompanying sketch was designed for stamping six sides of a hexagon brass "toddle top" (also known as a "put and take top") at one stroke of a press. During the fad for spinning these tops, the writer was superintendent of a small screw machine shop where orders for thousands of these tops were received. The machining was performed on automatic screw machines, and this die proved fast and satisfactory for stamping the letters in the sides.



Die For Stamping "Toddle Tops"

In the base **A** are six slots, equally spaced, in which are placed the six stamps **C**. The outer ends of the stamps are made with a 15 deg. taper. The stamps are all held in place by the plate **D**, but are allowed enough freedom for a sliding fit in their respective slots. The upper part of the die, **B**, is made to fit over the lower part, and is bored to a 15 deg. taper to correspond to the taper on the ends of the stamps. When the upper part of the die comes down, all six of the stamps are forced toward the center simultaneously, striking the piece and making impressions on all sides at once. The movement of the stamps does not exceed $\frac{1}{32}$ in., however. The stop pin **E** regulates the height of the top in relation to the stamps. This type of die could be used for a wide variety of similar jobs.



Design of "Toddle Top"

Salvaging Milling Machine Arbors By Welding

By P. L. BUDWITZ

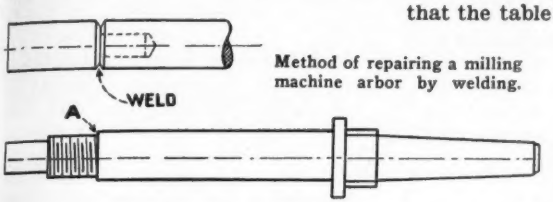
MILLING machine arbors used in production milling are subjected to both hard use and abuse, the support bearing and thread on the type of arbor shown in the illustration being subjected to more wear than any other portion. When the support bearing becomes so badly worn that the arbor is useless, or when it breaks at the point indicated as **A**, it may be successfully repaired by the welding process. The damaged end of the arbor is cut off at the shoulder, and a hole is bored into the arbor as shown. A false end is rough turned and driven into the hole, the joining shoulders being

(*Continued on page* 49)

Ideas From Readers

(*Continued from page 44*)

chamfered so that the liquid metal will seat properly. Enough stock is left on the false piece so that it can be



Method of repairing a milling machine arbor by welding.

finish-turned after welding. We have found that arbors repaired by this method are as good as new ones, and the repair can be made at much less than the cost of a new arbor.

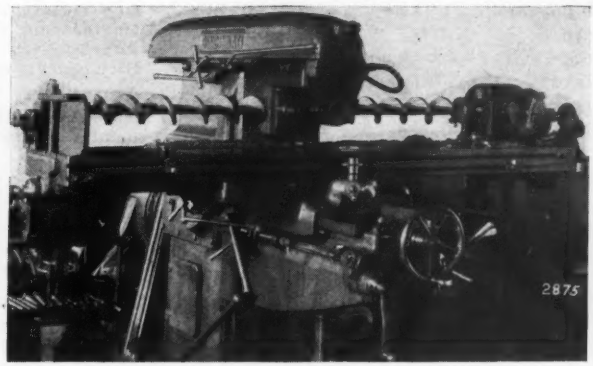
Milling a Spiral Conveyor Pattern

By R. M. CHARLES

A TOOLROOM job that was unusual enough to be interesting, and that required a great deal of ingenuity on the part of the shop foreman, is shown in the accompanying illustration. In order to make a pattern for a screw conveyor, a spiral had to be cut from a solid steel bar. The diameter of the bar was just under five in. and the core, or center, was to be left 1½ in. diameter, necessitating the removal of a considerable amount of metal. The lead of the screw was five inches.

The largest equipment available for the job was a Cincinnati No. 5 plain high power miller. Although this machine is one of the largest standard millers on the market, it was really too small for the job, due to the fact that the table travel is 50 in., whereas the spiral was over 71 in. long. However, the machine was made to serve and turned out an excellent job. The cuts were taken to the full extent of the table travel and then the piece was reversed and finished. The table of the machine is just long enough so that the work could be held between the centers of a universal dividing attachment.

Because of the small diameter of the section at the center of the spiral, a special steadyrest was made to take the thrust of the cut. For roughing, a spiral mill mounted on an arbor was used and the steadyrest was clamped to the machine-table. The finish cut was taken with a 2-in. diameter end mill, with the steadyrest mounted on the arbor support as shown in the illustration.



Cincinnati Miller Set Up To Mill 71-In. Pattern For Spiral Conveyor.

Odds and Ends For the Note Book—Discussion

IN "Odds and Ends for the Note Book," on page 26 of the February, 1931, issue of MODERN MACHINE SHOP, Mr. Kasper describes a method of determining the diameters of two small bolts to take the place of one large bolt. Mr. Kasper uses square root, which is correct and also accurate.

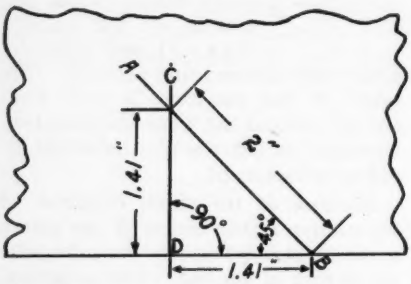


Illustration of described method.

Another method of finding the required size of the two smaller bolts is as follows:

With the 45-deg. head of the combination square, draw a line at an angle of 45 degrees with any finished edge, such as a piece of sheet iron or board. Then, along the 45 deg. line, measure off the diameter of the large bolt, which in the case illustrated is 2 inches. Mark the dimension as shown. Now draw a line from the edge at a 90-deg. angle from the edge, to intersect the 2-in. point on the 45-deg. line. The length of this line, which is approximately 1.41 in., will be the required diameter of the smaller bolts.

While this method may not be exact, it should be borne in mind that bolts in this size range are usually found in even eighth-inch diameters. This method is useful to the mechanic who may not be familiar with the uses of square root or who does not choose to use it. Another method is: Multiply the diameter of the large bolt by 0.7071.

—BACK WOODS MECHANIC.

Calendar of Coming Events

JULY 27-AUG. 1—Fourth Biennial Conference of World Federation of Educational Societies, at Denver, Colo.

AUG. 23-29 — International Industrial Relations Congress, at Amsterdam, Holland. For information address Mary van Kleeck, Russell Sage Foundation Bldg., New York, N. Y.

SEPT. 21-25—Annual Meeting of American Society for Steel Treating and National Metal Exposition, at Commonwealth Pier, Boston, Mass. W. H. Eisenman, Secy., 7016 Euclid Ave., Cleveland, Ohio.

OCT. 12-16—Twentieth Annual Safety Congress, at Civic Opera Bldg., Chicago, Ill.

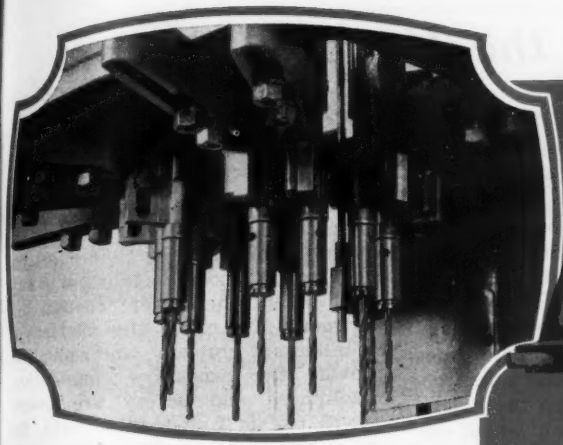
OCT. 13-16—Twenty-fifth Annual Convention of Illuminating Engineering Society, at William Penn Hotel, Pittsburgh, Penna. Secy., Illuminating Engineering Society, 29 West 39th St., New York, N. Y.

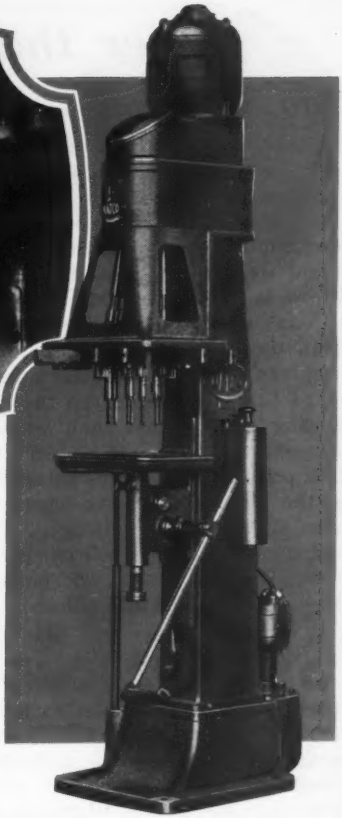
NOV. 30-DEC. 4—Annual meeting American Society Mechanical Engineers, at Engineering Societies' Bldg., 29 West 39th St., New York, N. Y. Calvin W. Rice, Secy., same address.

NOV. 30-DEC. 5—First National Exposition of Mechanical Handling Equipment, at Grand Central Palace, New York, N. Y. Chas. F. Roth, Mgr., International Exposition Co., Grand Central Palace, New York, N. Y.

The Clouds Are Breaking!

A large motor manufacturing corporation has ordered $250,000 worth of gear grinding machines from an Eastern machine tool builder. A few more of such orders would drive out the psychological delirium tremens and start America on the way to a healthy mental condition again.





FASTER . . . MORE SENSITIVE MORE FLEXIBLE!

Easily adjusted to handle a wide range of small work, the NATCO D-5 Multi-Driller and Tapper incorporates a number of new and better features which point to lower costs on drilling and tapping of small holes.

NATCO D-5 DRILLER AND TAPPER

This *new* NATCO "Multiple" is equipped with a ten-spindle head, spindle speed change gears, quick-reversing vertical motor, a new-type hand or foot operated table, an improved arm-type switch that controls the point of tap reversal.

WRITE FOR BULLETIN No. 201

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U. S. A.

Over the Editor's Desk

"It Is Not Honest--"

WHAT James A. Farrell, president of the United States Steel Corporation, blurted out—probably on the spur of the moment—at a recent meeting of the Iron and Steel Institute could well be pondered by manufacturers in other lines. Mr. Farrell said "I don't see any hope of better prices until the presidents of the companies stop the present diabolical situation. . . . I think we should run the risk of closing down rather than waste our raw materials . . . . You can't blame this price-cutting on the salesmen. It is the big chiefs in the organization who are doing the cutting . . . . It is not honest for us to sell our steel below cost and knock off something from our dividend and reduce wages."

It is rarely ever that the margin which represents the difference between profit and loss is sufficiently important to the purchaser to influence his decision as to whether he shall or shall not purchase the materials he needs. It *may*, however, influence him as to *where* he shall purchase, and if a seller can be found who will part with his wares at less than it cost him to make them, the purchaser gains by so much. As Mr. Farrell says, however, he gains at the expense of those who have invested their money in the business and at the expense of the workers to whom a reduction in wages usually means a reduction in living standards.

Incorporation of the small percentage which represents profit will not reduce the volume of business; on the contrary, it will make possible the cross-flow of commerce by which economic equilibrium is maintained.

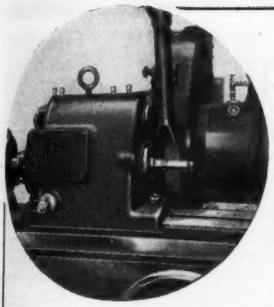
"Good Housekeeping"

THE methods employed to keep the General Motors Truck Corporation's plant clean, as described by O. H. Johnson on page 16 of this issue, are as simple as they are effective. Such methods could be adopted in any plant where there were enough departments to make the matter of cleanliness a problem—and enough to provide the necessary competition. Cleanliness and safety are twins; where one is found, there will the other be in evidence also. The methods in use in this plant to protect the workers and keep the accident record down to the minimum are interesting, also, and an article—also by Mr. Johnson—telling how the safety campaign is carried on will be published in an early issue of MODERN MACHINE SHOP.

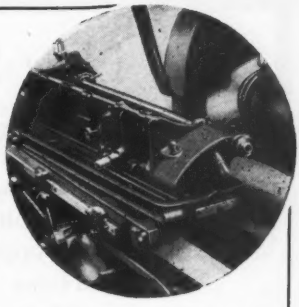
A Good Example

THE Pennsylvania has placed an order for $16,000,000 worth of electric railway equipment, Gerard Swope, president of the General Electric Company, says: "For the administration of the Pennsylvania Railroad to do this at this time shows not only vision as to the needs of the future, but courage to go ahead now when it is doubly effective in putting this new equipment on the Pennsylvania lines on the lowest basis of cost that has been reached in many years, and secondly, providing work for an additional number of men in various parts of the country and in that way spreading the effective and constructive work they are doing."

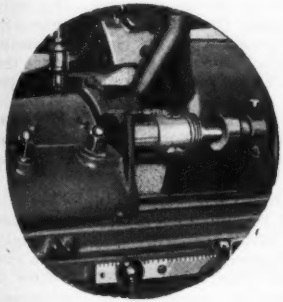
Sixteen millions of dollars can dispel a lot of gloom.

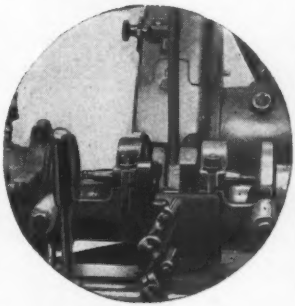


Here Is Some Landis Flexibility

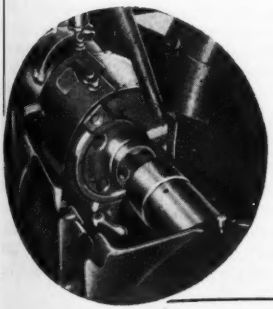


THE standard Landis Type A 6″x 20″ and 6″x 30″ Plain Hydraulic Grinders are of sufficient flexibility to make them suitable for a great number of grinding operations. Some of the many available extra and special attachments are here pictured. Depending upon the nature of the work, still others may be supplied.



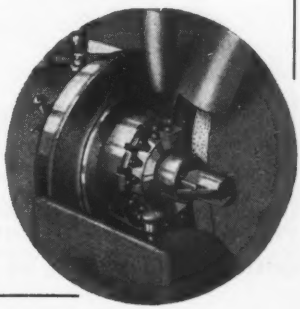


Production estimates will gladly be submitted upon your sending us blueprints of parts falling within the capacity of these flexible Landis machines. The sooner you act the sooner your grinding costs will decrease, for just as surely as the night follows the day, yesterday's equipment will not economically do today's work.



LANDIS TOOL COMPANY

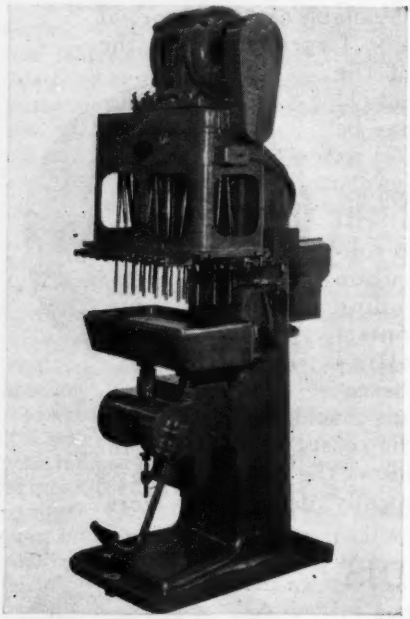
Waynesboro, Penna., U. S. A.



New Shop Equipment

Ex-Cell-O Semi-Automatic Multiple Spindle Machine For Drilling Or Tapping Small Holes

Recently the Krueger Division of the Ex-Cell-O Aircraft & Tool Corporation, 1202 Oakman Blvd., Detroit, Michigan, was called upon to design a multiple tapping machine for tapping work while submerged. Twenty-one full adjustable spindles were provided on the machine, with a minimum center distance of $\frac{7}{16}$ in., and the spindles were designed for drilling or tapping holes not to exceed $\frac{1}{4}$ in. in diameter. Several unique features are incorporated in the design of this machine, one of which is the manner in which the work is flooded during the working operation.

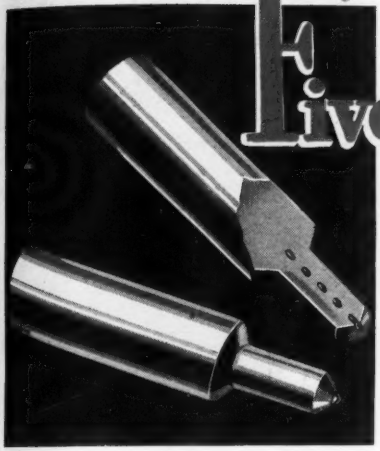


Ex-Cell-O Semi-Automatic Adjustable Multiple Spindle Machine for Drilling or Tapping Small Holes

Suitable fixtures are mounted on the table, which is raised to meet the drills or taps. The table proper is mounted on two plungers within a tank or container, which is filled with the cutting compound. The whole table unit is so designed that when the foot pedal, shown in the lower part of the illustration, is pressed downward, the center work table remains stationary for a portion of the stroke while the outer or tank portion moves upward. This movement causes the work to be submerged in the cutting fluid in the tank portion of the table and it is at this time that the drilling or tapping operation is performed. When the foot pedal is released, the center table with the work again emerges from the cutting fluid and the operator is able to unload and reload above the cutting fluid.

The whole table assembly is counterweighted so that the weight of the fluid, together with the work and work table, is so balanced as to insure ease in operating the foot pedal. The outer, or tank table, is mounted on hollow rack guide bars through which extend two plungers supporting the work table. At the bottom of these two plungers are two adjustable set screws which govern the downward movement of the work table while the tank table continues to recede. Another unusual feature is incorporated in the machine when designed for tapping. The tapping spindles are threaded through their support arm to the correct lead for the thread of each individual tap. By this arrangement the taps are fed into the work correctly, eliminating the possibility of cutting away or stripping the first few threads of the hole being tapped. A reversible motor is provided when the machine is to be used for tapping.

The spindle drives are of standard universal joint construction, due to the range of center distances that must be



Five Diamonds in One Tool

Means

Many Savings For You!

SAVINGS IN INVESTMENT . . . savings in resetting . . . savings in handling costs . . . eliminating loss from abuse . . . these are a few of the savings effected by the use of the KOEBEL Multi-Set Diamond Dresser.

This diamond tool is radically different than other diamond tools because it has several small tested quality diamonds mounted in one tool. The KOEBEL Method (patents pending) of surrounding the stones with a newly developed metal assures you a mounting that will hold the diamond rigidly in place until it is entirely used up.

The KOEBEL Multi-Set Diamond Dresser is made in three-set, four-set, and five-set types to meet all requirements. They'll meet your requirements, too. Send for an illustrated bulletin and price list.

Every KOEBEL diamond is subjected to a rigid laboratory test which indicates inherent flaws never before detectable by the most careful observation. Diamonds not meeting the high standard set for KOEBEL tools are rejected.

KOEBEL

KOEBEL-WAGNER DIAMOND CORP.
144 Orange Street Newark, N. J.
Detroit Indianapolis Chicago
Cleveland New York

Multi-Set Diamond Dressers

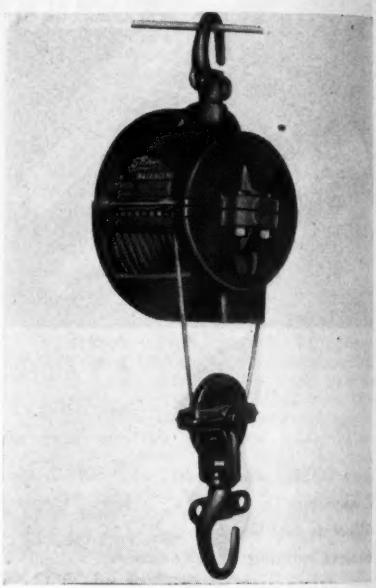
made. Three cluster gears driving through worm gears operate each group of spindles in the upper portion of the head. This type of drive is substituted for the conventional spur gear drive assembly. The worm shaft and motor are connected by means of Texrope drive, which insures quiet operation and eliminates the shock when the motor is reversed during the tapping operation.

To operate the machine, the work is placed in the proper fixture on the table and the foot pedal pressed downward by the operator. The upward movement of the table operates a limit switch which starts the motor in a forward rotation. The table is raised to a positive stop and held there by the operator while the spindles feed into the work to a pre-determined depth, then the motor is automatically reversed and is stopped when reaching the original or neutral position. This particular cycle is used only for tapping; in drilling, the foot pedal is used for feeding and the motor continues to run in one direction only.

"Thor" Balancer

The Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill., has brought out the balancer shown in the illustration for use in suspending portable electric and pneumatic tools from the ceiling to a point above the work. The cable drum is of tapered design which type of construction makes it possible for the main spring to maintain an equal holding effect regardless of the position of the load within the travel range of the balancer. For instance, when the load is at the highest point, the cable is fully wound on the drum and the last layer of cable is therefore exerting force or torque against the spring through the shortest radius of the drum. When the load is lowered, the cable unwinds on the tapered drum to a larger radius of the drum, so that while tension on the main spring increases with lowering of the load, the "torque arm" or radius of the drum increases. The taper of the drum is in even ratio to the strength of the main spring. Consequently, the Thor Balancer balances the load at any point within its range of travel and the load may be moved to any position without effort.

The cable is of hardened steel, and is fastened at one end to the drum and at the other end to the casing, thereby becoming a double strand, the safety factor of which is 90 to 1. The adjustment of the balancer to hold the required load can be done by one man in perfect safety because of the worm and worm gear arrangement. All Thor Balancers are provided with safety devices. In case the main spring should break,



"Thor" Balancer.

the load will not drop; the drum will automatically stop.

The Thor Balancer is made in three sizes as follows:

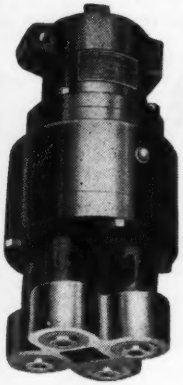
The No. 1 balancer has a capacity of 30 lb. Weight, 17 lb. Range of balanced travel with 30-lb. load, 3 ft.; with 15-lb. load, 5 ft.

No. 2 balancer has a capacity of 60 lb. Weight, 35 lb. Range of balanced travel with 60-lb. load, 3 ft.; with 30-lb. load, 6 ft.

No. 3 balancer has a capacity of 80 lb. Weight, 36 lb. Range of balanced travel with 80-lb. load, 3 ft.; with 60-lb. load, 4½ ft.

Kellerflex Mica Undercutter

The task of undercutting the mica on industrial motors has been rendered much simpler and easier by the development, by the Keller Mechanical En-



Multiple Units

From Single Drills

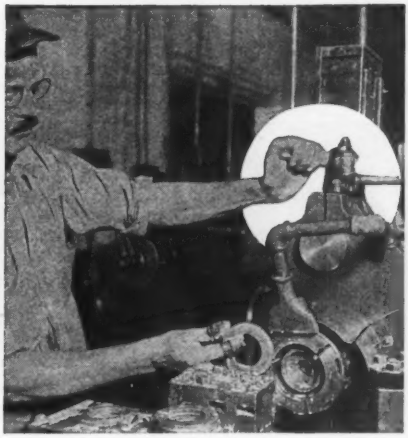
Designed to fit any type of drill press, a U. S. Drill Head converts any single spindle drill into a multiple unit quickly.

No time wasted making adjustments—spindles are fixed. Any number of holes, fifty if necessary, can be drilled as easily as one.

We will design a U. S. Multiple Drill Head to meet your individual requirements. Tell us your needs. Address

The United States Drill Head Co.

1954 Riverside Drive
Cincinnati, O., U. S. A.



A Twist of the Wrist

IT'S DONE

WITH LOGAN Air Operated Devices on the job, all the effort required to operate drill jigs, vises, arbor presses, milling fixtures, work ejectors, etc., is a twist of the wrist to actuate the control valve.

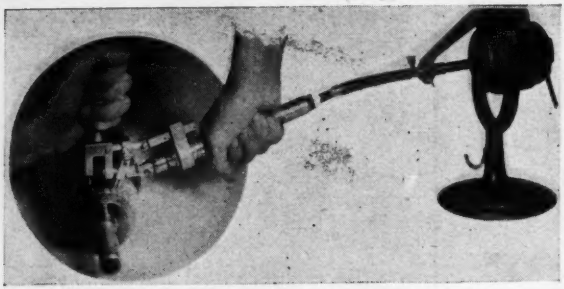
And, when it comes to chucking, or holding work in all types of machining operations, no other devices eliminate waste in time, effort, and motion as completely as LOGAN Devices.

Let us show you what LOGAN Devices will do for you. Send us blue prints of your work for our recommendations. Or . . .

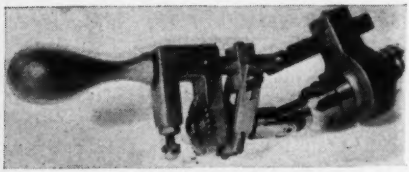
Shall We Send You a Catalog?

THE LOGANSPORT MACHINE CO.
LOGANSPORT INDIANA

gineering Corporation, 84 Front St., Brooklyn, N. Y., of an attachment that can be used with a flexible shaft machine. The attachment is the Kellerflex Mica Undercutter, shown in the illustration. The attachment is adjustable to a degree that will permit its use on practically any type of industrial motor without the necessity of dismantling the motor. The device can be attached to flexible shaft machines of the suspended type, or on the floor stand type, and can be moved readily to any part of the plant.



Kellerflex Mica Undercutter on 6-in. bench stand.



Handpiece in which the cutter is carried.

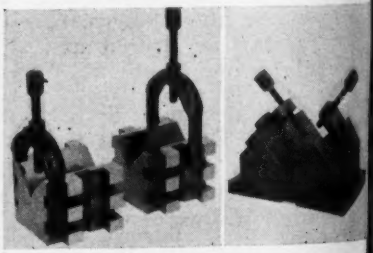
The Kellerflex machine recommended for use with this attachment is the Super-ball bearing motor, ¼ h.p. (A. C. or D. C.) for either 110 or 220 volts. 1750 r.p.m., mounted in a universal swivel yoke. The flexible shaft is ⅜ in. in diameter, 5 in. long with black enameled metallic casing reinforced by heavy nickel plated coil spring, and equipped with a grease cup. The handpiece is of ball bearing construction with ¼-in. collet and nickel plated sleeve. The undercutting device is used with a 1-in. or 1⅛ in. "V" or "U" type cutter. The cutter spindle runs in oilless bearings, and the driving shaft, which is chucked in the collet, has a universal joint so that the device may be used on commutators of railway and industrial haulage motors without dismantling motors or generators. The device is equipped with an adjustable depth gauge and two guide rollers with angular adjustment. The depth gauge, saw, and guide rollers may be adjusted for work on commutators varying from 4 in. to 24 in. diameter, cutting to any desired length.

The tool is rigid, easily handled, and is designed for accurate work. The attachment is nickel plated and has a handle which may be inserted at the top or the side according to the available working space.

B & S V-Blocks and Clamps Nos. 750B and 750C

The Brown & Sharpe Mfg. Co., Providence, R. I., has announced two new tools, to be known as V-blocks and clamps No. 750B and V-block No. 750C. The tools, which are shown in the accompanying illustrations, are provided with features which make them especially convenient for use on unusual jobs.

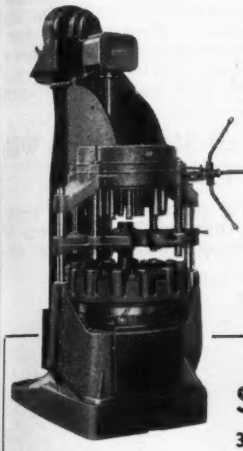
Stepped clamping lugs are provided on V-blocks and clamps No. 750B, making the tools particularly adaptable for inspectors' use; the blocks can be used on their sides, as the clamps do not project. The stepped construction also allows of changing the clamps quickly from small work to work up to 2 in. diameter. The



B & S V-Blocks and Clamps Nos. 750B and 750C.

SNYDER TOOLS

SAY "GOODBYE" To Hard Drilling Problems



WHEN you have a seemingly hard . . . or unusual . . . job of drilling, reaming, countersinking, etc. . . . find out how easy it can be solved with SNYDER Tools.

The illustration shows a machine that was stripped of its original multiple drilling head and equipped with a complete SNYDER Tool Set-Up for machining the gear pockets and shaft holes of a pump body and drilling and countersinking the cover screw holes.

Investigate the possibilities of SNYDER Tools on your work. Send blue prints or samples to SNYDER Engineers and . . .

SAY "GOODBYE" TO YOUR HARD DRILLING PROBLEMS

Snyder Tool & Engineering Company

3400 EAST LAFAYETTE AVENUE, DETROIT, MICHIGAN

Every Detail a Feature!

THAT'S the story of the CINCINNATI HYPRO PLANER TYPE MILLER . . . every detail designed to make it an outstanding feature.

For instance, both the vertical feed and the two transverse milling heads are operated through a hardened and ground worm and a bronze worm wheel. The result is an *unusually* smooth flow of power to the cutter at any speed, insuring finer finishes.

Write for a bulletin describing many more features.

THE CINCINNATI PLANER CO.

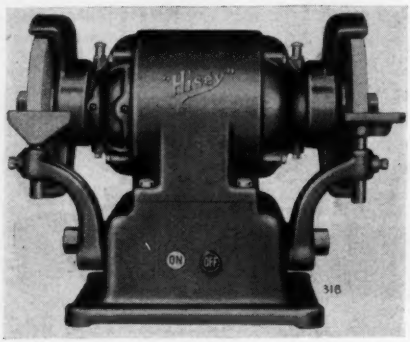
3100 SOUTH STREET -:- -:- CINCINNATI, OHIO

blocks are ground in pairs and all sides are at right angles, making it possible to use them in any position. The V-grooves of any pair of blocks are ground central and in alignment, assuring high accuracy. Each block is of hardened steel and is 2½ in. long, 2¾ in. wide, and 2 in. high. They are made and sold only in numbered pairs. The clamps are drop forged, and the clamp screws are hardened.

V-block No. 750C leaves the entire top side of the work accessible. The clamps are designed to hold stock of square or rectangular cross section, as well as round stock. A hole through the center of the block allows drills, drifts, and so on to project through the work—which is a real help on many jobs. A tongue in the bottom is a convenience when the block is used on a machine table where it can be clamped conveniently by the flanges. Wherever relatively light work is being done along the top side of stock, the No. 750C tool will be found convenient. The block is of hardened steel, 3 in. long, 4¾ in. wide, 2 in. high, and is ground on the bottom. It has a capacity of round stock to 1½ in. diameter. Clamps and screws are hardened.

"Hisey" 6-In. and 7-In. Wheel Grinder

The illustration shows the Hisey 6-in. and 7-in. wheel grinder, which has been placed on the market by The Hisey-Wolf Machine Co., Cincinnati, Ohio.



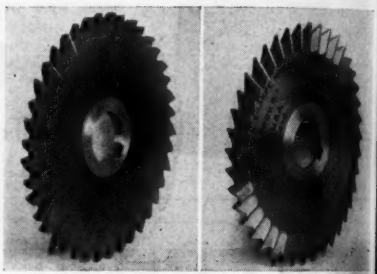
"Hisey" 6-In. and 7-In. Wheel Grinder.

This machine is equipped with an improved commutating type repulsion motor, to comply with the more stringent electric codes now in effect in many localities. The starting current required is unusually low under all conditions, and is said to be less than one-third the current consumption of a grinder equipped with a split-phase motor.

Low voltage due to line drop and other conditions which cannot be overcome have no objectionable effect on the "Hisey" grinder. The improved commutating type repulsion induction motor has no dragging centrifugal switch, and will start and pick up speed instantly.

B & S Metal Slitting Saws With Side Chip Clearance

The Brown & Sharpe Mfg. Co., Providence, R. I., has added to its line of cutters twenty-one sizes of metal slitting saws with side chip clearance. These saws are of high speed steel, and have been developed to increase production and reduce cutter breakage. The design of the saws allows chips to be carried out of a deep slot without jamming.



B & S Metal Slitting Saws With Side Chip Clearance.

Unusually large chip space is provided; in addition to the pockets at the sides of the teeth, the sides of the saw are recessed. Concavity is also provided on the lateral cutting edges. The extra clearances reduce rubbing and dragging with attendant heating and jamming tendencies. These saws are said to make, at one cut, deep slots which under similar conditions would be impractical with the ordinary type of saw.

The saws are made in diameters from 3 in. to 8 in. in a suitable range of thicknesses. The teeth of saws up to and including $\frac{5}{32}$ in. thickness are made in the conventional straight tooth type; saws of $\frac{7}{128}$ in. thickness are made in staggered tooth type.

We Are Asked--

WHY does the Kellerflex stand up so well under severest operating conditions? Why does it do a perfect finishing job quickly, easily and most economically?

The answer is simple: A variety of speeds allows the use of the correct tool at maximum cutting capacity. The ball bearing motor is full-sized, not a midget. The shaft is **genuinely flexible.** And the hand piece—ball bearing or Timken roller bearing equipped. Significant is the motor and shaft, adjusting themselves **automatically** to the position of the work. Flawless construction throughout.

In short, a most efficient, compact, long-lived machine for economical grinding, filing, sanding and polishing.

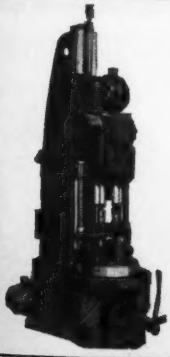
Write For Further Information

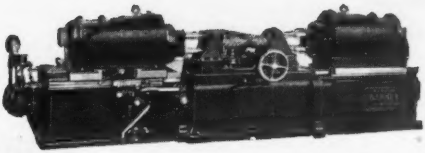
Complete stock of Kellerflex Machines, rotary files, grinding wheels and polishers at Chicago and Brooklyn.

KELLER MECHANICAL ENGINEERING CORP.
84 FRONT ST. BROOKLYN, N. Y.

KELLERFLEX

STANDARD & SPECIAL DRILLING & BORING MACHINES





Left—Vertical Hydraulic Feed Boring and Reaming Machine, with rotary table. Machining is progressive and continuous except for indexing.

Above — Horizontal Duplex Machine, with Hydraulic feed, for drilling radiator sections.

W. F. and John Barnes Co.
ROCKFORD, ILLINOIS
Established 1872

"Red Ring" Model SIB Universal Gear Tester

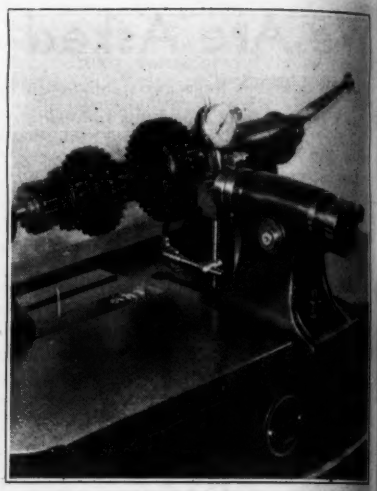
In response to a definite request for a machine of this type, the National Broach & Machine Co., 11455 Shoemaker Ave., Detroit, Michigan, has brought out a machine for the measurement of the spiral angle, eccentricity, index error, tooth form, and parallel of spur and spiral or helical gears. With this machine,

"Red Ring" Model SIB Universal Gear Tester.

the various functions of the gear may be measured at one setting of the gear.

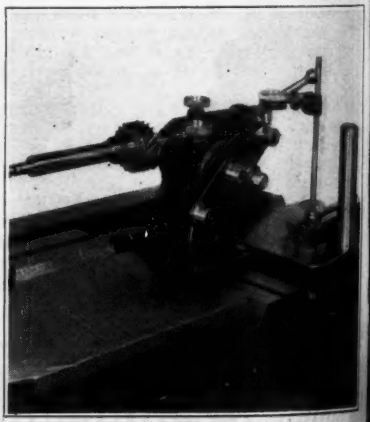
To operate, a rack tooth gage is inserted between the teeth in exact alignment with the axis of the gear. A sine bar that is 6 in. from center to center of the buttons is attached to the rear of the rack gage, and is used to measure the spiral angle. With the gage fitted snugly between the teeth, the angle is measured by means of a stack of blocks. A dial indicator can be set to read zero on the blocks, and then the reading over the sine bar pin will give the variations in angle.

The wide, flat surfaces on the table of the machine permit of many other uses in the gear department. The table

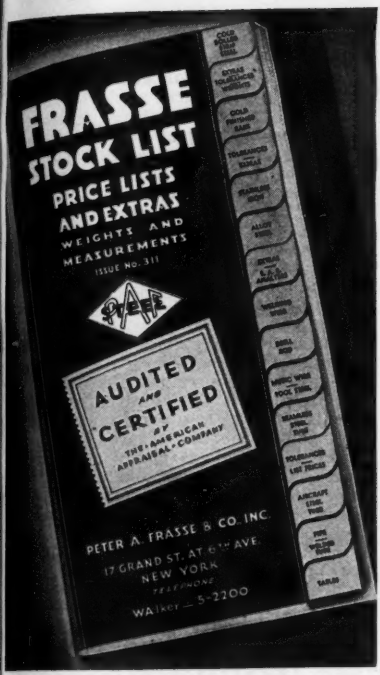


Checking Tooth Parallel and Indexing of Spur Gear.

is of heavy ribbed construction and is designed so that it can be used as a surface plate. Shelves are provided in the base of the machine for tools, and the door has a Yale lock. As standard equipment, the machine is furnished with centers for mounting the gear, and with cross slide with tooling for measuring the spiral angle and eccentricity of spur gears. An additional head is



Checking Spiral Angle On Helical Gear.



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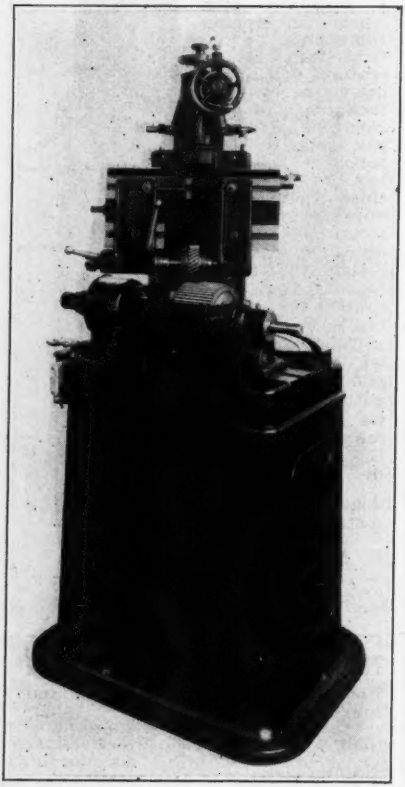
available for checking the indexing, and special equipment can be furnished for measuring other gear functions if desired.

"Red Ring" Gear Lapping Machine

The machine shown in the illustration is the "Red Ring" Model SIB lapping machine for the lapping of spur and spiral gears, which has been developed by



"Red Ring" Gear Lapping Machine.

the National Broach & Machine Co., 11455 Shoemaker Ave., Detroit, Michigan. This machine is so designed that the axis of the gear and the lap cross at a considerable angle, as shown in the illustration, providing a definite cross-sliding action between the lap and the gear teeth at all points of contact. It is said that this construction avoids the possibility of irregular shape. A spiral lap is used for spur gears and a spur lap is used for spiral gears. The machine shown is offered particularly for use in the lapping of automobile transmission gears of the spiral spur type.

Wear of the lap is compensated for by adjustment of the angle of contact from time to time. This adjustment is controlled by means of a special spiral angle checking device which is calibrated to give the exact adjustment of the machine for any given error in spiral angle caused by wear. By reciprocating the gear, the lapping action is spread across the face of the gear. The down feed of the gear against the lap will rapidly remove the uneven or surplus metal from the gear, correcting any eccentricity or index error, and giving each tooth the correct curvature.

Well cut and carefully heat treated gears can be lapped in three minutes; more irregular gears require five or six minutes. On carefully made gears, the laps will give efficient service on approximately 400 gears for each cutting, and provision is made for two recuts. An operator can easily take care of three or four machines.

The maximum capacity of the Model GLB machine is 7 in. O. D.; 5 D. P.; 1½ in. width of face, and 12 in. between centers. The maximum capacity of the Model GLE machine is 15 in. O. D.; 4 D. P.; 5 in. width of face, and 28 in. between centers.

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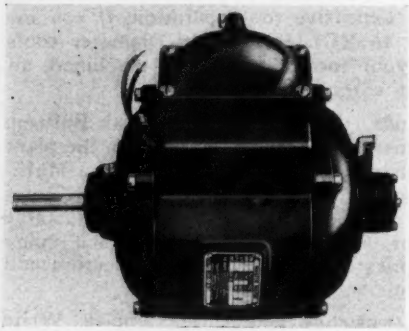
sembly cost for the pump manufacturer.

Some of the other features of this combined Explosion Resisting Motor and Switch are: Bringing the motor leads out through the motor frame, which permits the removal of both end covers



"Master" Explosion-Resisting Motor and Switch Combined.

without disturbing the seal, moisture proof construction, quiet operation, high starting torque, large overload capacity, and exceptionally sturdy bearing construction which assures continuous operation free from trouble and service interruptions.

These units are designed for either horizontal or vertical shaft operation and are suitable for use wherever the surrounding atmosphere may be inflammable due to the presence of hazardous vapors. These motors can be purchased in sizes from ⅛ to 1/3 h.p. inclusive, repulsion-induction, polyphase and direct current, all of which are interchangeable as to external dimensions.

G & L No. 30 Two-Spindle Horizontal Boring, Drilling and Milling Machine

A combination of two spindles—the conventional main spindle and an auxiliary high speed spindle—comprises one of the important new features of the No. 30, which has been added to the line of horizontal boring, drilling and milling machines built by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. The main spindle, which is 3 in. in diameter, provides 36 speeds in fine geometrical progression between 8.3 and 500 r.p.m. The auxiliary high speed spindle, 2 in. in diameter, and mounted within the back gear shaft of the main spindle, gives an additional 36 speeds between 25 and 1500 r.p.m. These two spindles provide a combined speed range of from 8.3 to 1500 r.p.m. Smooth, quiet running at these high speeds is assured by the use of herringbone gears and preloaded combination radial and thrust ball bearings.

All the speeds and feeds for the spindles are compactly built within the head, which is completely enclosed. The 36 changes of speed to either spindle are controlled through only two levers, conveniently located on the front of the head. Both speed change levers have a position indicator that facilitates the selection of the desired speed.

The 18 feeds to either spindle are obtained through a feed unit built onto one of the front cover plates of the head. The unit can be removed for inspection at any time by removing the plate. A rotary gear change lever controls the nine feed changes and indicates on a dial the feed applying at any time. A back change lever controls another nine feeds. A third lever controls the direction of feed. A set of pick-off gears is incorporated in the feed gear train so that any desired positive lead may be obtained at any time. A hand wheel at the upper left of the head provides for a slow hand feed to the spindle.

Incorporated in the feed train is an automatic depth gage that can be applied to either spindle, and can be set to throw out the feed automatically at any point within 6 in. of the spindle travel. A spindle selector lever controls the operation of the spindles. When the speed and feed mechanism is connected to the high speed spindle, the spindle selector lever disengages the main spindle so that while the high speed spindle is being used, the main spindle does not rotate. A separate clamp is provided for locating any spindle in any desired position for milling.

The entire head is automatically lubricated. A pump delivers oil to a distributor at the top of the head from which oil is directed all over the inside of the head, thoroughly lubricating all running parts. The spindle ball bearings, as well as the sliding ways of the head, are lubricated by wicks from the distributor.

The bed is unusually large for a machine of this size and is of heavy box type construction, internally ribbed to offer a sturdy support for the various units of the machine. A large cutting lubricant tank is cast within the bed, and when required provision is made on

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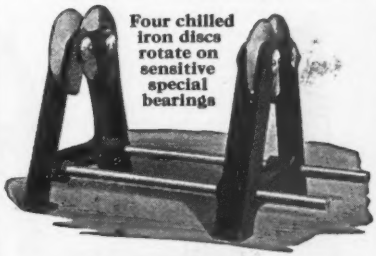

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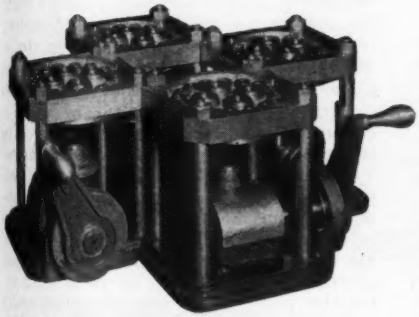

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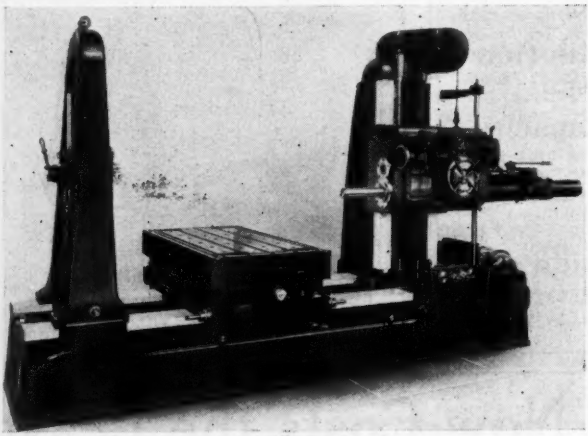
the different units for directing the solution back to this tank.

The table is of semi-steel and of heavy box section, heavily ribbed in every direction. The top of the table has 1 in. stop holes and five standard tee slots for ¾-in. diameter bolts. Chip pockets are cast in the table at each end and the tee slots run the full length of the table. The table is supported on an unusually heavy saddle which gives ample support to the table at every position of its cross travel. A multiplying lever clamp is used for clamping the table to the saddle and also the saddle to the bed.



G & L No. 30 Two-Spindle High Power Precision Horizontal Boring, Drilling and Milling Machine.

Within the front head end of the bed is built a separate feed unit for moving the different units. The milling feeds are obtained from a separate drive shaft ahead of the start, stop and reverse clutches. Thus the reversal of the machine does not reverse the feed or rapid traverse. The levers for engaging the feed to any unit are very conveniently located to the operator, and they are always engaged by moving the lever in the direction the unit is to move, either by feed or rapid traverse. This feature removes all uncertainty as to which direction the units will move as soon as the feed or rapid traverse is applied, and permits a directional control of the different units of the machine independent of every other unit. This feature is a big advantage when profile milling.

The hand feed for moving the different units is through a safety crank handle. To feed by hand, the crank handle must be held in a jaw clutch against the spring. As soon as the hand is removed the crank is disengaged and swings free. This safety feature prevents injury to the operator and possible damage to the machine if the rapid traverse should be engaged without first removing the crank handle. The mechanism for the movement of the different units is equipped with micrometer dials. These dials are adjustable by a thumb screw which allows them to be set in any position.

This No. 30 machine, like the other two-spindle machine built by this company and announced in these columns a short time ago can be furnished in table type, planer type and floor type, using the same principal units in all three types.

Additional principal specifications of this machine are as follows:

Range of feeds to main spindle in inches per revolution of spindle, .007 in. to .375 in.; range of feeds to auxiliary spindle in inches per revolution of spindle, .002 in. to .125 in.; range of milling feeds in inches per minute, .8 in. to 40 in. Horse power required, 15. Rapid traverse to all units, 120 in. per minute.

As far as the range of the machine is concerned, a wide selection is offered in the size and travel of the different units. Vertical adjustment of the head on column is up to 48 in. on all types of machines. The maximum distance between spindle nose and end support on the table type machine can be made as long as required with tables up to 36 x 72 in. On the planer type machine practically any size table within reason can be furnished. On the floor type machine the travel of the column on the runway and the width and length of the floor plate can be made to suit requirements.

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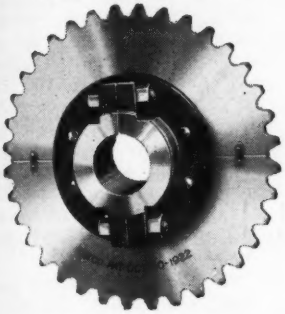

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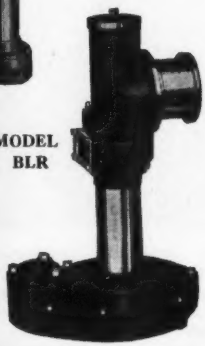

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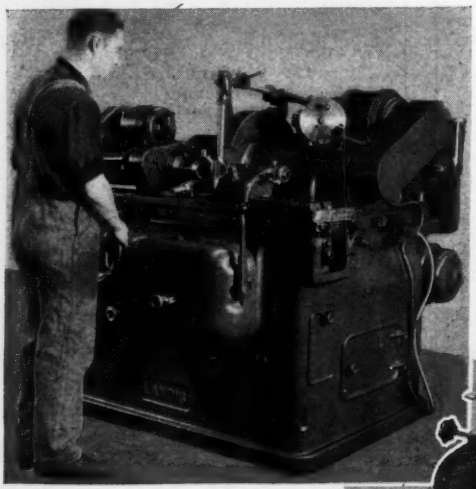
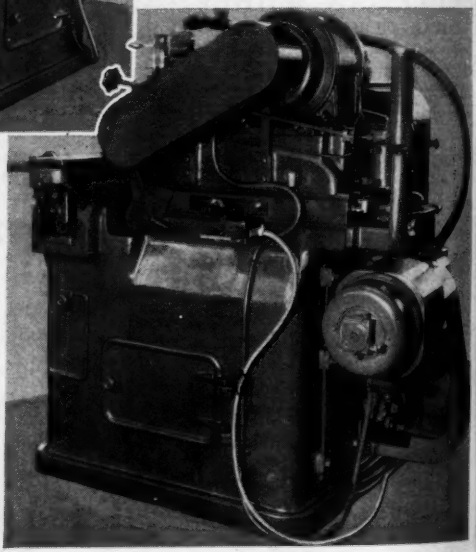
Landis Type C 6-In. Plain Hydraulic Grinder

The illustrations show two views of the Landis Type C 6-in. Plain Hydraulic Grinder, which has been released to industry by the Landis Tool Co., Waynesboro, Penna. This machine is intended to fill the need for a comparatively small rapid traverse plain grinding machine, highly flexible but at the same time ideal for the mass production of light parts such as small bearings, small motor armatures, and so on.





(Above)—Landis Type C 6-In. Plain Hydraulic Grinder. (Right)—Showing Right End and Rear.

The outstanding feature of the machine is its great productiveness coupled with ease of operation. The hydraulic table traverse provides a range of table speeds from 6 in. to 240 in. per min., with all of the smoothness, quietness, and ease of control associated with this type of drive. Accessibility is another desirable feature. By removing the large cover at the front of the bed, all control mechanisms are exposed. None of them is entirely within the bed. The design of the pump mounting is such as to make it quite accessible.

The bed of the machine is of box type construction. The water reservoir is cast integral with the bed, while the base forms a reservoir for the oil that is used by the hydraulic traversing system. The work carriage traverses on a flat guide and a V guide with one vertical side, both guides having chilled surfaces. Guide-way lubrication is of the flood type, filtered oil being used and being supplied by the same oil pump that furnishes pressure for the hydraulic system. The work carriage reverses without jar or vibration.

The grinding wheel head is supported by a V and flat guide with chilled surfaces. Steel back babbitt wheel spindle bearings are used, and are lubricated continuously. The oil passes through a filter before entering the bearings. The grinding wheel spindle is driven at the right hand

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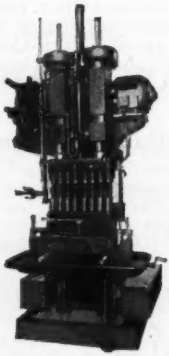

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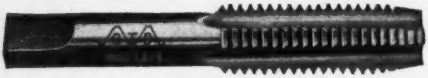
end through multiple V belts from a balanced motor mounted on top of the wheel base casting at the rear. An 18 x 1½ x 8-in. grinding wheel is considered standard.

The hydraulic system consists of a twin cylinder type table traversing mechanism and a Tuthill internal-geared oil pump. Because of the use of the twin cylinders, the control valve is made to govern the flow of oil from the end of one cylinder into the corresponding end of the other, thus providing smoothness of operation. The oil pump is mounted on the rear of the bed where it, along with the water pump, is driven by a constant speed motor.

Standard equipment includes a plain wheel feed mechanism. At extra cost a hydraulic automatic wheel feed may be supplied or for certain high production jobs a hydraulic straight infeed mechanism is also available. The headstock is driven by a constant speed motor. Four work speeds are made possible by changing the pulleys and the belts at the left-hand end of the head. The machine is available in 6 x 18-in. size, weighing 3750 lb. net, without electrical equipment, and can also be had in 6 x 30-in. size, weighing 4000 lb. net, without electrical equipment. Constant speed motors are used throughout; a 1/3 h.p. motor for the headstock, a 1 h.p. motor for the pump drive, and a 3 h.p. motor for the wheel spindle drive.

Greenfield "Tru-Lede" Tap

Ground-thread taps in which the maximum lead tolerance is 0.0005 in. in 1 in. are now being made by the Greenfield Tap and Die Corp., Greenfield, Mass. This accuracy is said to be possible only because the threads of these taps are ground after the taps are hardened. Tru-Lede taps have, however, the same pitch



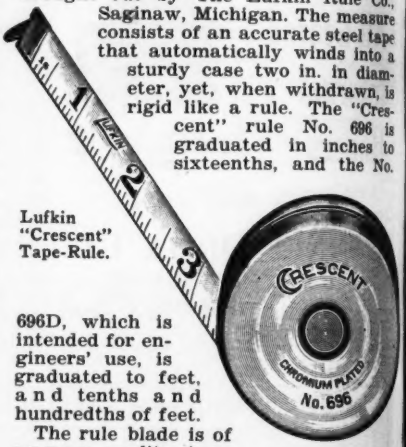
Greenfield "Tru-Lede" Tap

and major diameter tolerances as cut thread taps (for producing Class 2 fits), insuring long wear. The shanks of the taps are ground concentric with the threads, which prevents the taps from wabbling and cutting oversize because of eccentricity.

It is said that the use of taps of the accuracy with which True-Lede taps are made eliminates the most troublesome factor in assembling—lead error. It is also claimed that they operate with a minimum of friction and can be run at high speeds. Tru-Lede taps are available in hand, machine screw, and gun styles, in all standard sizes and pitches.

Lufkin "Crescent" Tape-Rule

A six-foot measure in which are combined the convenience of a pocket tape and the utility of a rule has been brought out by The Lufkin Rule Co., Saginaw, Michigan. The measure consists of an accurate steel tape that automatically winds into a sturdy case two in. in diameter, yet, when withdrawn, is rigid like a rule. The "Crescent" rule No. 696 is graduated in inches to sixteenths, and the No. 696D, which is intended for engineers' use, is graduated to feet, and tenths and hundredths of feet.



Lufkin "Crescent" Tape-Rule.

The rule blade is of super quality tempered steel, stiffened by special forming. It is nickel plated with dark markings. Unsupported, it may be projected as a rule. It will also flex around and measure circular, round-cornered, and other curved objects. The case is chromium plated, and has a smooth-working, spring winding device with a ratchet stop. Simple pressure on the push button recoils the blade far more quickly than any rule can be folded.

B. & S. No. 4 Geared Pump

The Brown & Sharpe Mfg. Co., Providence, R. I., is now prepared to furnish a pump of larger capacity than the Nos. 1, 2 and 3 Geared Pumps in its regular line. This pump, which is known as the No. 4, has a capacity of 15 gal. per min. at 500 r.p.m., with a corresponding increase in discharge of 3 gal. per min. at 1000 r.p.m. Suction and discharge ports of 1¼-in. pipe size provide for the most favorable handling of this volume of liquid.

The No. 4 pump is of the same design

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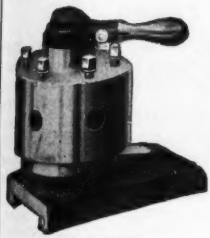

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For any make or size of Lathe, old or new.

Ask for Circular No. 18

FAY & SCOTT

DEXTER, MAINE

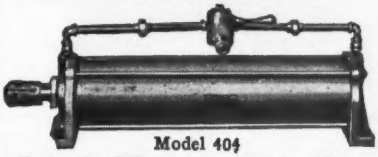
MAKE AIR WORK FOR YOU!

ON scores of jobs Air Power will do twice as much work as Man Power and at less cost . . . when you use KECKLEY PNEUMATIC CYLINDERS and HOISTS.

Go through your shop. Check up where Air Power could more efficiently replace Man Power.

Let KECKLEY ENGINEERS help you! Just send them blue prints of your requirements and they will recommend a KECKLEY Product guaranteed to suit your requirement. There's no obligation.

Send for Bulletin 2304

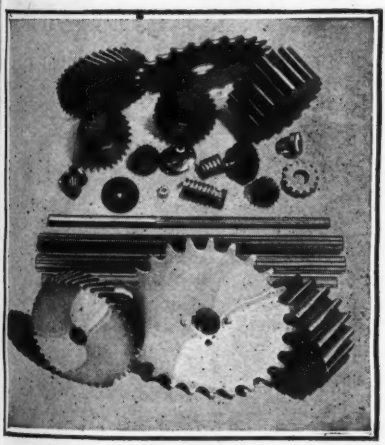


Model 404

O. C. KECKLEY CO.

563 Washington Blvd., CHICAGO, ILL.

Builders of
Hydraulic and Pneumatic Machinery



This illustration shows only a small variety of M-C Gear Products.

MEISSELBACH-CATUCCI MFG. CO.

70 STANTON STREET
NEWARK NEW JERSEY

YOUR GEARS

are important!

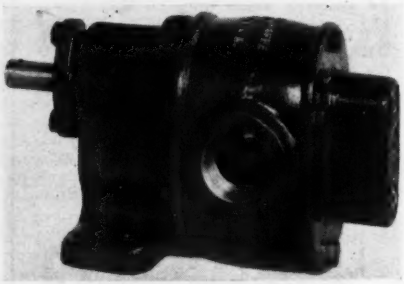
IMPORTANT . . . . because the efficiency and durability of your machine depends a great deal upon the design, quality, and accuracy of your gears. See that your gears are the best money can buy.

And, where can you buy better gears than M-C Gears. M-C Gears are made to standards that enable you to equip your machines with the best in gearing . . . . at a price that is reasonable.

Send your gear problems to M-C Engineers. They'll show you how to solve it economically with. . .

M-C GEARS

and construction as the other well-known pumps made by this manufacturer and includes all the features possessed by them. It is particularly adaptable as a coolant pump for machine tools, as its



B & S No. 4 Geared Pump

volume permits of a copious supply of coolant, either under pressure where such may be desirable as for drilling and flushing out chips or where a cascade of coolant is desired without pressure. For larger machinery it makes a very efficient lubricating pump. The pump is adaptable for other uses than as a coolant pump, and where a complete power unit is required, the pump can be furnished electrically-driven.

Hercules Midget Truck

Tote boxes, barrels, or other receptacles which do not weigh more than 400 lb. when loaded can be moved easily with the "Hercules" Midget Truck, which is being made by the Illinois Iron & Bolt Co., Carpentersville, Ill. The truck is entirely of steel construction, the frame and handle being of heavy tubing which combines strength with comparatively light weight. A rubber hand grip is provided at the end of the handle, and the wheels are rubber-tired to eliminate noise in operation.

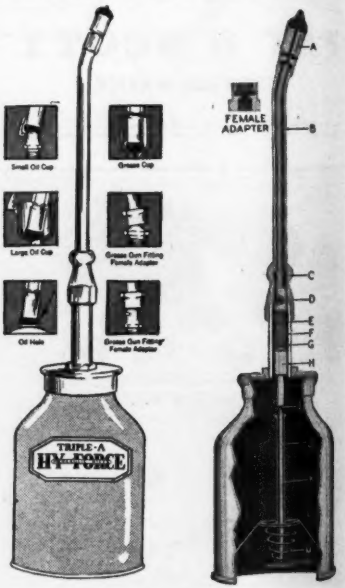
Hercules Midget Truck

The full length of the truck is 52 in. and the width at the dash is 12 in. The diameter of the axle is ⅝ in., with wheels of 5¼ in. diameter, and the weight is approximately 27 lb. All joints are welded, providing solid construction with no bolts to loosen. The truck is finished in battleship gray with red wheels.

Triple-A Hy-Force Hydraulic Oiler

The Triple-A Specialty Company, 2101 Walnut St., Chicago, Ill., is now marketing a high-pressure oiler which is complete in itself and does not require the use of special fittings, but utilizes the oil hole or grease cup with which the machine is equipped. It is stated that a pressure of 1,000 pounds or more is easily built up by the use of an ingenious hydraulic pump which is operated by a thumb plunger in the bottom of the oiler. The pressure forces the oil into the bearing.

In order to make possible the high pressure, a patented oil-tight tip or seal is screwed into the end of the stem,



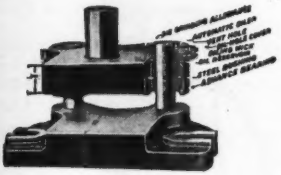
Triple A Hy-Force Hydraulic Oiler

making a tight, oil-proof contact at the hole and allowing the pressure to force the oil to every part of the bearing surface, without spilling any on the outside. A special female adapter is also furnished for use with the ordinary type

BAUMBACH

Automatically Oiled

DIE SETS



Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

Your Inquiries Solicited
Send for New 120 Page Catalog

E. A. Baumbach Mfg. Co.
1806 S. Kilbourne Ave. Chicago, Ill.

TWENTIETH CENTURY BALANCING TOOL

Always on the level

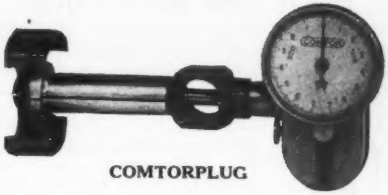
The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

Ask for the Bulletin

Sundstrand Machine Tool Co.
ROCKFORD, ILL.

COMTORIZE

WITH return of business activity, it will be found that the leading mechanical manufacturers have modernized their methods of Gaging and Size Control, for better and cheaper products.



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We are at your service with the original, most highly developed and most complete Comparator System.

Comtors include bench, portable and continuous gages for inside and outside diameters, adapted to all operations of production, inspection and selection.

COMTORIZED PRODUCTS are of the highest precision because all gaging errors are completely eliminated by fully automatic means.

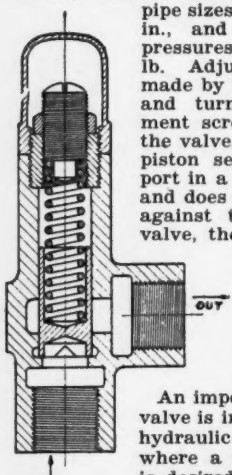
COMTORGAGE

THE COMTOR COMPANY
WALTHAM, MASS.

of fittings which are used on certain kinds of machines. The Triple-A Hy-Force Hydraulic Oiler is made entirely of metal. It can easily be taken apart for cleaning, and will readily handle all kinds of oils from the thin penetrating oil to 600-W.

Fulflo Non-Chattering By-Pass Piston Type Relief Valve

A non-chattering piston type oil relief valve, or by-pass, is now being manufactured by the Fulflo Specialties Co., Blanchester, Ohio. The valve is made in pipe sizes from ⅜ in. to 1¼ in., and is suitable for pressures from 20 lb. to 120 lb. Adjustment can be made by removing the cap and turning the adjustment screw at the top of the valve. The cylindrical piston seat closes off the port in a shearing manner and does not seat abruptly against the body of the valve, thereby eliminating the possibility of the pounding or chattering noise which is produced in some other types of valves.



Fulflo Non-Chattering Piston Type Relief Valve

An important use of this valve is in connection with hydraulic pumping units where a specific pressure is desired to be maintained, especially on machine tool hydraulic mechanisms, oil-burning equipment, rams, presses, and so on. The valve is of cast iron with a brass piston. The unit is also available in all-bronze construction. The valve requires no attention when once installed and set for the desired pressure.

U. S. Four-Speed Flexible Shaft Machine

A belt-driven shaft machine which has been placed on the market by the United States Electrical Tool Co., 2471 West Sixth St., Cincinnati, Ohio, is equipped for four speeds; 950, 1250, 2400, and 3600 r.p.m. The machine is available in all popular horsepower sizes, and in all styles of mountings—overhead, vertical, trolley, floor or stand, bench or horizontal. A complete line of tools and attachments for all flexible shaft uses are included, among which are mill-cut rotary files that are said to give from two to eight times longer service than ordinary files.

U. S. Four-Speed Flexible Shaft Machine

Many other advanced features are claimed by the manufacturers, including a spiral bearing the full length of the housing, improved slide couplings that take up all end play, and a new ball-bearing hand piece.

Globe Automatic Combination Drilling and Tapping Machine

In addition to the line of automatic tapping machines made by the Globe Tapping Machine Co., 753 Central Avenue, Bridgeport, Conn., this firm has brought out the combination drilling and tapping machine shown in the illustration. The machine as shown was built to drill four No. 36 holes and tap two No. 6-32 thread holes in a die casting at a rate of 30 finished pieces per minute. The machine is shown with a standard conveyor table, but the machine can be adapted for work of other sizes, and it can be furnished with either dial or push feed table.

The parts are loaded onto the fixtures by hand and are ejected automatically after machining. The fixtures are mounted on the standard Globe conveyor links and are made to index the part 90 deg. when the conveyor itself is indexed. By this arrangement, holes may be drilled and tapped at any angle on the periphery. The fixture shafts are arranged with

"PRO-CUN-IER"
TAPPING DEVICES

For only a few dollars, a "Pro-cun-ier" reversible tapping head converts your drill press into a sensitive tapping machine.

Our brand new cork clutch reversible tapper (illustrated) taps perfect holes at 1 to 2,000 R. P. M. or better.

Capacity 0 to ½-inch—Price only $45.00

Send for details and free trial offer.

"Pro" tappers frequently tap ¼ to ½ million holes before even the clutch is replaced.

Here's all the "Pro" steel clutch tappers cost complete with our new style tap holder:

No. 1—¼-in Capacity; Safety $28.00; Positive $22.00
No. 2—½-in Capacity; Safety 34.00; Positive 28.00
No. 3—⅝-in Capacity; Safety 40.00; Positive 34.00
No. 4— 1-in Capacity; Safety 52.00; Positive 46.00

PROCUNIER SAFETY CHUCK CO., 12 So. Clinton St., Chicago, Ill.

work in the dark

WHAT kind of steel is it? Is it oil hardening or water? What job is the tool for? What is the job number? Who made it?

These questions are answered economically and speedily if the article is properly marked.

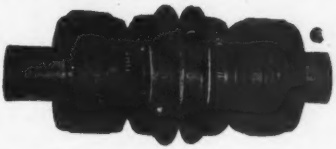
Schwerdtle Steel Alphabet and Figure dies in sets, are designed for just such work as marking dies, tools, parts, and for all miscellaneous marking.

The simplest mistakes are the costliest, and the remedy for them is very inexpensive.

INSIST on PLAIN, ADEQUATE LABELING of TOOLS

THE SCHWERDTLE STAMP CO.
13 CANNON STREET BRIDGEPORT, CONN.

The
PULLMORE
INDUSTRIAL CLUTCH

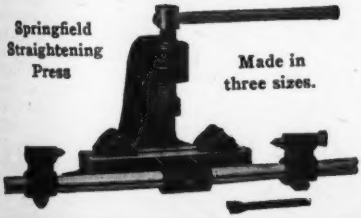


THE PULLMORE Industrial Clutch is employed as standard on many types of machinery, due to its extreme compactness and efficient operation. It is furnished in Single or Double types, and for operation in oil, or dry.

Let us supply you with additional details and make recommendations on any clutch application you may have.

ROCKFORD DRILLING MACHINE CO.
10 CATHERINE STREET
ROCKFORD ILLINOIS

CUT YOUR STRAIGHTENING COSTS

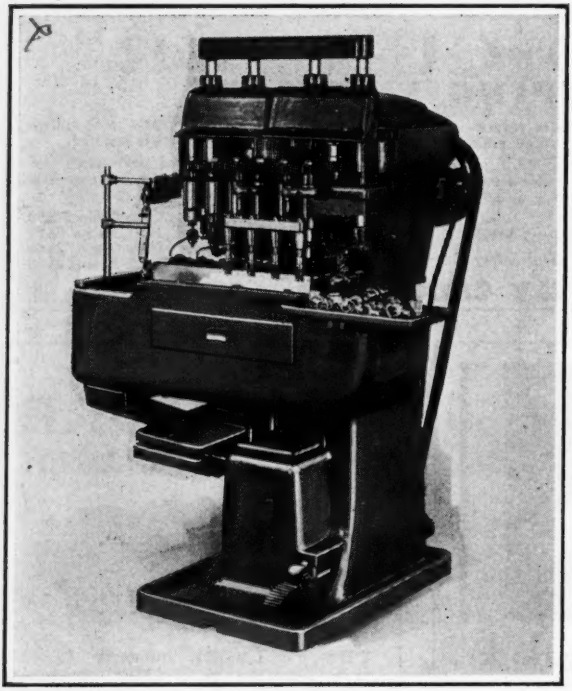


THE Springfield Straightening Press is the ideal tool for straightening any length of rough or finished work—truing sprung tools—testing and balancing cams, or crank shafts—and scores of other jobs.

Place it on the bench—it saves your operators' time by eliminating waste steps, and allowing quicker handling of work.

Send for illustrated folder suggesting many uses.

The Springfield Machine Tool Co.
630 West Southern Avenue Springfield, Ohio
We also manufacture Engine Lathes and Shapers.



Globe Automatic Combination Drilling and Tapping Machine

sprockets and turn against stationary pins on the table. A spring plunger stops the fixture at the desired angle and the guide bushings for the drills are also arranged to clamp the parts when the drilling is done.

The spindles and index mechanism are driven from a 1½ h. p.-1750 r.p.m. motor, mounted on a tilting plate inside the base of the machine. A belt transmits power from the motor to the clutch at the rear top of the machine. The clutch is operated by means of a foot treadle. One spindle slide is arranged with drilling spindles and the other with tapping spindles, permitting the use of the maximum allowable time for drilling. This is accomplished by using a cam feed for the drill, the cam having a long lead and quick rise, and working independently of the slide carrying the tapping spindles. All spindles are adjustable and are driven through spur gearing.

The conveyor feed table as shown is of new design and is used on the regular Globe tapping machines as well as on the other machines made by this company. The straight motion feed permits taking of pieces up to 6 in. wide by 14 in. long. As the parts are moved by the machine and the spindles can be arranged to suit, holes can be drilled and tapped as on a single spindle machine without sacrificing any of the advantage of rigid spindle construction. One part is finished at each stroke of the machine.

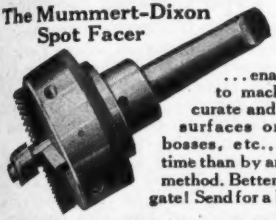
Rockwood Short Center Drive

To make the leather belt efficient on short center motor hook-ups for individual motors, the Rockwood Mfg. Co., Indianapolis, Ind., has developed a drive in which a special Rockwood paper pulley, belt of special thickness, and motor base of special design are combined to produce the desired results. The motor base is pivoted so that the weight of the motor is utilized to supply the necessary tension on the belt, thus eliminating the use of idlers. In this manner the undue belt wear caused by the double bending of the belt as it passes over three or more pulleys is eliminated and the life of the belt is prolonged.

An endless belt is used which can be made endless on the work without dismantling the driven machine. All of the drives are engineered for a prescribed belt tension with a specially made flat leather belt of high quality. Once installed, the drive does not have to be touched, but will run without any attention whatsoever for a long period of time. As the weight of the motor maintains the prescribed belt tension at a constant rate, and as the operating tensions of good leather belts on paper pulleys are said to be the lowest known to belt transmission, the drives operate with very low total tensions. The efficiency of the drive is said to be higher than 99 per cent, and ,according to tests, the belt slippage is less than 1 per cent.

The weight of the motor is an essential factor in the engineering of this drive. While the specification book lists drives from 1 to 50 h.p. A.C. 60-cycle 1800 r.p.m., the listed drives can only

The Mummert-Dixon Spot Facer



. . . enables you to machine accurate and smooth surfaces on small bosses, etc., in less time than by any other method. Better investigate! Send for a bulletin.

MUMMERT-DIXON CO. 120 Philadelphia St. HANOVER, PA.

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"The finest collets in the world." Full stock, at all times standard styles including Rivett, Hendey, Cataract Seneca, Becker, etc.

Write for new Bulletin,—100-AM "Rivett Draw-in Collets and Chucks"—also price list

Rivett LATHE AND GRINDER CORP. Brighton Dist., Boston, Mass.

Runde Offset Boring Heads

THE LAST WORD IN ECCENTRIC BORING HEADS

Less Overhang Greater Boring Range

Built rugged, compact and with precision. The largest head weighs only 8½ lbs., and has a boring range of 12 inches.

Made to fit all standard spindles. Circulars covering all sizes furnished on request.

Progressive Tool Company 419 HENDRIE ST. DETROIT, MICH.

Mounted Grinding Wheels

For all small holes (open or blind), races, bushings, etc., and most any place hard-to-get-at; as on dies, tools, gears, etc. Hundreds of sizes, shapes, any shank.

CHICAGO WHEEL & MFG. CO.

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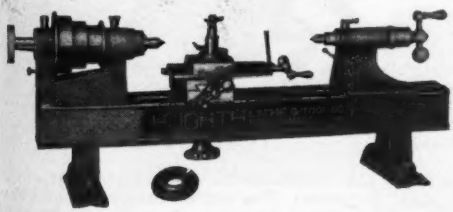

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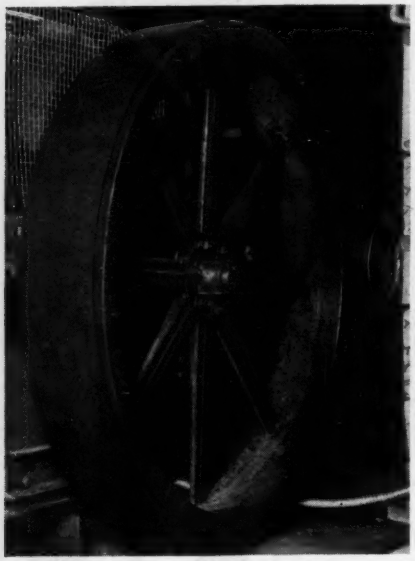
Precision Bench Lathe!

with its many patented features is the ideal bench lathe for factory and tool room. It is accurate for precision work. Send for catalog.

HJORTH LATHE & TOOL CO. 60 STATE ST. BOSTON, MASS.

be used for modern A.C. motors. A.C. motors of the older and heavier types, D.C. motors, and A.C. motors of 50 or 25 cycles must each have the motor weight ascertained so that the drive can be figured correctly. The drives are engineered for N.E.M.A. standard pul-



Rockwood Short Center Drive in use on calendar roll. Center distance, 32 in. Space between pulleys, 2 in. Arc of contact, small pulley, 111 deg.

leys, and the exact cross section of belting required for every motor application has been worked out accurately. The position of the motor on the arms is engineered for all motors; thus when a drive is selected from the drive data book, there is no further engineering to be done. Six standard bases only are required to take care of all makes of motors up to 50 h.p., 1800 r.p.m. The bases replace the usual motor rails and save the cost of the rails.

The limitation of the drive is that it cannot drive downward. The motor can be mounted on wall, ceiling, or floor, but the axis of the motor pulley must not be higher than the axis of the driven pulley. There are some exceptions, but the rule holds true generally. The drive is sold as a complete drive. The drive has been in process of development for five years, and 150 of these drives have been running continuously for four years.

New Type Oxweld Goggles

The Linde Air Products Company, 30 East Forty-second Street, New York, N. Y., has recently introduced a new type of welder's goggles, designated as Oxweld No. 12 goggles. This improved type embodies features never before found in safety appliances of this kind.

Absolute comfort is assured since they are designed to fit the eyes and are adjustable to conform to the individual nose. The edge of the cup coming in contact with the face is shaped to conform to the general contour of the welder's cheekbone and nose, thus fitting smoothly around the eyes. The eye-pieces are joined with a leather strap, adjusted by means of a metal buckle, so that they may be correctly spaced to the width of the face. Ventilation has been carefully considered in designing these goggles. Patented ventilation ports on each side of the eye-cups are so constructed that it is impossible for sparks or light to reach the inside of the cup. The depth of the cup is another feature, permitting ample circulation of cool air.

The field of vision has been increased by the use of 50 mm. diameter lenses instead of the usual 47 mm. lenses. Brown color lenses, known as the "B" type, are available as with older type goggles and in addition, a new special quality green lens, known as the "A" type, is available in three different shades. Lenses may be easily changed by simply removing the metal cups, which unscrew from the frames of the eye-pieces.

The material of which these goggles are made differs from that used in any other eye protector. It is a molded plastic substance known as Oxweldite which is formed over a fabric base and

Oxweld No. 12 Goggles

is resistant to heat, light and electric current. The entire construction of these goggles is such that they will readily withstand the usage to which goggles are subjected in welding shop or plant.

Norton Issues Booklet On "Commercial Lapping"

The history of the art of lapping is traced from the pyramid-building era in a new booklet that has been issued by Norton Company, "Commercial Lapping for Close Limits and High Production." The book contains 61 pages, and is divided into two parts, the first part covering the subject of lapping in general and the second part dealing with the various types of Norton lapping machines and their operation.

The subjects covered in Part 1 are as follows: Origin and Development; Fields for Use; Advantages; Methods; Hand Lapping; Machine Lapping. Part 2 takes up the following subjects in order: Types and Operation of Norton Lapping Machines; Classification of Types of Machines. Vertical Machines: Types Nos. 1, 2 and 10U; Type No. 15; Workholders for Vertical Machines; Preparation of Parts for Lapping; Operation of Types Nos. 1C, 2C, 1F, 2F, and 10U Machines; Preparation and Care of Cast Iron Laps; Lubrication of Machine; Lapping the Pieces; Eccentricity; Lapping to Close Limits; Operation of Types 15C and 15F Machines; Lubrication of Machine; Dressing the Laps; Lapping Lubricants. Horizontal Machines: Classification; Preparation of Parts for Lapping; Operation; Types No. 30 and No. 40; Type No. 50; Lubrication of Type 50 Machine; Lapping Arms, Type 50.

The text is amplified with illustrations showing types of work that should be lapped, reproductions of surfaces that have been finished, work in process on the lapping machine, various types of Norton Lapping Machine, types of workholders, special fixtures for holding work in the lapping machine, and special arrangements for lapping production work. A copy of the booklet can be obtained by addressing Norton Company, Worcester, Mass.

Standardized, Interchangeable Die Sets

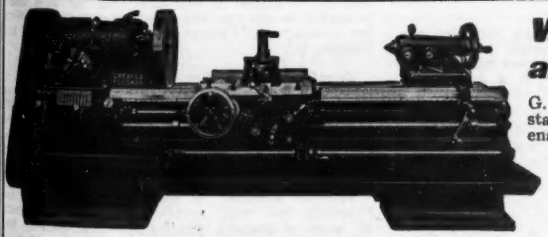
Danly Machine Specialties, Inc., Chicago, has issued the seventh edition of its well-known loose leaf catalogue, showing its complete line of standardized, interchangeable die sets and die makers' supplies. A page of exceptional value shows the largest die set and die space that can be used on all standard makes and sizes of presses. The maximum diameters of round dies that can be mounted on the regular standard sets are also given for each size. Considerable new matter has been added, while the number of pages has been greatly reduced, making for greater ease in use, the engineering data now being even more get-at-able. Copies may be obtained by addressing Danly Machine Specialties, Inc., 2122 South 52nd Avenue, Chicago, or branch offices at Detroit, Cleveland, Rochester and Long Island City.

By mentioning MODERN MACHINE SHOP when writing to the firms who are advertising in this issue, you are helping to build up a bigger and better magazine for your own benefit.

Greenerd Arbor Presses

Write for our Catalog showing 64 different styles

EDWIN E. BARTLETT CO.
NASHUA, N. H.



Where Costs are Watched...

G. K. Single Lever Control Lathes stand "Ace High" because they enable the operator to select any speed of an extremely wide range through one lever. There is no non-production time!

Write for a Catalog.

THE GREAVES-KLUSMAN TOOL CO., Cincinnati, O.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Grinding Tungsten Carbide Tools: Instructions on grinding tungsten carbide tools, including directions as to angles, types, grades, and grains of wheels, wheel speeds, and so on, are included in a folder that can be obtained without charge by addressing Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Tornado Portable Electric Blower: An air-blast can be had anywhere, any time, by users of the electric blower made by the Breuer Electric Mfg. Co., 845 Blackhawk Street, Chicago, Ill. Write for free folder.

Disc-Inspected Tool Steels: A bulletin discussing the advantages of disc-inspected tool steels can be had by writing to The Carpenter Steel Co., Reading, Penna.

Mounted Grinding Wheels for use in small holes such as are found in bushings, dies, gears, tools, etc., are described in a catalog that has been issued by the Chicago Wheel & Manfg. Co., 110 S. Aberdeen St., Chicago, Ill. Copy free upon request.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Bolender Gear Burnishers: Gears will operate more smoothly and more silently if burnished. Full description of the Bolender Gear Burnisher can be had by addressing the City Machine & Tool Works, Third and June Sts., Dayton, Ohio.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

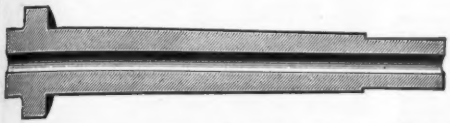
Tool Steel Handbook: This catalog, published by the Columbia Tool Steel Company, 550 E. 14th Street, Chicago Heights, Ill., contains descriptions and information as to correct use of tool steels. Also hints on how to avoid hardening failures, with information on heat treating methods and valuable information tables. Copy free upon request.

Comtorplugs: Interchangeable plugs for internal gaging, from .250 in. to 8 in. dia. and up to 24 in. in length, graduated by an amplifier to .0001 in., are described and illustrated in a circular that has been issued by The Comtor Company, Waltham, Mass. Copy free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.



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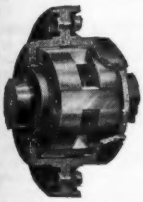

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Flexible Couplings

are recommended for motor driven equipment—guaranteed to stand up on the most severe drives. All steel—heat treated and lubricated.

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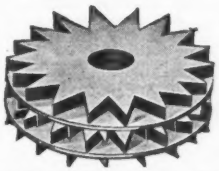
W. H. NICHOLSON & CO.
136 Oregon Street WILKES-BARRE, PA.

Grinding Wheel Dressers

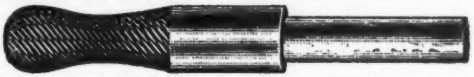
We make all types of Dressers and Cutters



Write for Catalog "M"

DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

GROBET ROTARY FILES



WE now offer the new Grobet Swiss Rotary File, made by the makers of the famous Swiss Files of the same name, that have established world fame for the last century.

These rotary files and rasps are made in hundreds of different sizes and shapes to meet every condition and requirement.

We have a stock of all shapes and sizes on hand, including many new cuts and styles.

Let us send you our new Catalog R. K.

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THE Boston Universal Angle Plate is applicable to so many different jobs that it will seldom lie idle in your tool room. It will be in constant demand by your operators of drill presses, milling machines, grinders, planers, etc.

It is a practical way of insuring against all the time consuming delays of setting up work . . . and will pay for itself in two months' time. Why not get the whole story . . . write for a bulletin.

U. S. Automatic Box Machinery Co. 459 Watertown Street Newtonville, Boston, Mass.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Steel Stock List: Steel buyers who send their names and addresses to Peter A. Frasse & Co., Inc., 17 Grand St., New York City, will each receive a catalog of the warehouse stock maintained by this company. The catalog also contains valuable reference data.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Hjorth Precision Bench Lathes is described and illustrated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keeler Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Lift By Air with a Keckley Pneumatic Hoist, made by O. C. Keckley Co., 563 Washington Blvd., Chicago, Ill. Write for Bulletin 1304.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Lindner Toggle Vise: A toggle vise that can be adapted to any size within the capacity of the machine is described in a catalog that can be had by addressing The Lindner Manufacturing Co., Wyoming and Forrer St., Lockland, Ohio. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

M-C Pinion Rod, made by the Meiselbach-Catucci Mfg. Co., 70 Stanton St., Newark, N. J., insures economy and accuracy in cut pinions. Send for information.

Installation and Maintenance of Lathes: A newly compiled booklet showing proper methods of installing, leveling and maintaining Monarch Lathes. It is useful information for every lathe user. Mailed free. Address The Monarch Machine Tool Company, Sidney, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Monnier-Dixon Co., 120 Philadelphia St., Hanover, Penna.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Co., 136 Oregon St., Wilkes-Barre, Pa.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

For DRILLER, MILLER, SHAPER OR PLANER

VISE

Three Sizes:
Jaws 6", 9" and 12" Long

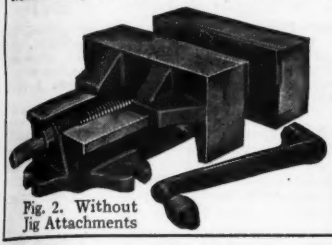

Fig. 2. Without Jig Attachments

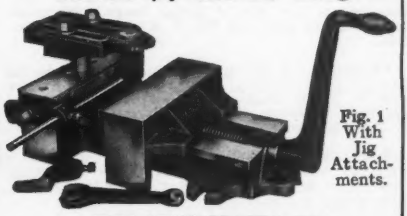

Fig. 1 With Jig Attachments.

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CLARITE HIGH SPEED STEEL
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It pays to use Good Tool Steel.

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CARE FOR TOOLS

in a GERSTNER Chest.

It Pays—in better work, easier work; in tools saved from loss, damage and "borrowing."

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It shows many styles

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Comparators
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WESTERN BRANCHES { 7338 WOODWARD AVE., DETROIT, MICH.
520 WYSON BUILDING, MUNCIE, INDIANA

"O. K." Tool System: The O. K. System for lathes, planers, shapers, boring mills, and other production machines consists of special forged steel holders with complete sets of tool bits of special design. Particulars can be had by addressing The O. K. Tool Co., Shelton, Conn.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Q-C Standardized Fixture Units in 677 sizes and 5 styles are described and illustrated in the Engineering Book put out by A. H. Pearson, 7 E. Grand Ave., Detroit, Mich. Copy free upon request.

"Most Frequent Mistakes Made in Hardening:" Users of steel can obtain a wall-chart on which are listed the most common mistakes made in hardening tool steels, results of mistakes as shown on the tools, appearance of fracture, and suggestions for remedying the mistakes, by writing to the Poldi Steel Corporation of America, 247 West 18th Street, New York, N. Y.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

Runde Offset Boring Heads: Eccentric Boring Heads, precision-made, with a minimum of overhang and a maximum boring range, to fit all standard spindles, are described and illustrated in a circular that can be had by addressing Progessive Tool Co., 419 Hendrie Street, Detroit, Michigan.

"Ramet" Cutting Metal: A new cutting metal that is said to cut alloy steels, manganese steel, or any other metal composition, is described in a folder that will be sent free upon application to the Ramet Corporation of America, North Chicago, Ill.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Waltham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Bench Lathe Mounting and Driving Equipment: Bulletin 120-A, issued by Rivett Lathe and Grinder Corporation, Brighton, Mass., contains complete descriptions and illustrations of modern and conventional countershaft, individual motor drive jackshaft, and speed box motor drive, also benches, cabinets, oil pans, etc. Copy free upon request.

Fullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

The Most Efficient Speed for the operation of special production units, power conveyors, and other machinery by the use of the WHS Speed Reducer and how it can be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springville, N. Y.

A Snyder Tool Set-Up, consisting of a Snyder ball-bearing multiple head, bushing plate, and work holding fixture, will convert a single spindle drill into a multiple drill at small cost. Particulars upon request. Address Snyder Tool & Eng. Co., 3400 E. Lafayette Ave., Detroit, Michigan.

Speed and Accuracy In Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue., Springfield, Ohio.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Rigidmilling Principles and Practice: A book that shows how the Rigidmill can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Change drilling speeds instantly without stopping the machine or touching a belt. This can be done with the Victor Super-Drill, made by U. S. Automatic Bor Machinery Co., Newtonville, Boston, Mass. Bulletin free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Change Punches Without Removing Die: The user of Hercules Interchangeable Punches and Retainers can change punches without removing the die from the press. Information that will help to lower die-building costs, reduce lost time for repairs, and increase press production can be had by addressing Whitman & Barnes, Inc., Detroit, Michigan.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

Henry Lindahl Foundry & Machine Co. Catalog No. 24

Catalog No. 24, issued by the Henry Lindahl Foundry and Machine Co., 5900 Ogden Ave., Chicago, Ill., contains illustrations and complete descriptions of the machine molded pulleys, ball bearing pulleys, steel split pulleys, wood pulleys, grooved pulleys, wire rope sheaves, self-lubricating bronze bushings, V-belt drives, V-belt pulleys and belts, gear blanks, and cast iron hand wheels made by this firm. The book contains complete directions for ordering equipment, together with a number of useful tables. A copy can be had without charge by any machine shop executive.

"Super-Johnson" Catalog

The Carlyle Johnson Machine Co., Manchester, Conn., is now distributing a catalog, called the "Super-Johnson" catalog, in which the improvements and advantages of the Super-Johnson Clutch are featured. In this clutch the expanding friction ring is faced on its periphery with a special heat-resisting material. A copy of the catalog can be had upon request.

So the HEAD CHEF cooked her meal *himself*

POOR little lady. The doctor had said, "Your food must be cooked just a certain way." And here she was in a big hotel. She called the manager and told him. He sent for the head chef and the head chef cooked her food himself.

Just a little extra service, perhaps not worth telling. But it's one of the things that bring people back again to United Hotels. Of course our rooms are bigger . . . our closets larger . . . our cafeterias low priced. All that counts. But it's that extra effort to please that really sets people talking. Try us . . . then you'll understand.

Extra service at all 25

UNITED HOTELS

UNITED HOTELS

By GEO. ALEXANDER MANN

Tuff On Tha Crockery

Grandma's new teeth
Are costly "by gee"
She's busted four saucers
A drinkin' her tea—

Huh—Who Wouldn't?

The average aviator would rather be an ace than a king.

Dad says before marriage they cry on your shoulder. Afterwards they jump on your neck.

Sez Clarence

I kissed her hand,
With grief I met,
I burnt my snoot
On her cigarette.

One o' the best we've heard lately is that the girls carry their money in their stockings 'cause they want to keep it where it will draw the most interest.

Sounds Fishy

He sued for the fish,
The judge overbearing,
Said, "Case is dismissed;
Can't grant you a herring."

Ev'ry car has two speeds—one when you're tellin' it to the judge and one when you're braggin'.

Don't brag 'bout bein' even tempered. Wet matches don't flare.

Maw says one o' the best ways to punish the children is to send 'em to bed without breakfast.

Perfect Control

"When dad spanks me,"
Said son, "I know it,
I get all red,
But never show it."

Men court trouble—then marry it.

It took the drug stores to put the larger holes in the smaller doughnuts.

Sez Josh

Janes these day are foolish,
That's why I hiss 'em,
They let kisses fool 'em
An' let fools kiss 'em.

Paw says matrimony is educational—it teaches a man to hang four suits o' clothes on one hook.

The press states, "Women are taking a part in public affairs". Huh—they said it—any affairs they take part in are bound to become public.

Before we can tell what the country is coming to—it will have to come to.